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TEACHING WITH INTERACTIVE WHITEBOARDS:

IS TEACHER EDUCATION UP TO IT?

A Study of Pre-Service Primary School Teachers' Education with Interactive Whiteboards

By

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ABSTRACT

Teaching with Interactive Whiteboards: Is Teacher Education up to IT?

Without quality teaching and learning based around a solid understanding of sound pedagogical principles, IWBs will be just another piece of hardware in the classroom. Unless teachers understand how to leverage interactive technology to create better learning experiences for their students, then we are wasting our time (Betcher & Lee, 2009, p .13).

Given the increasing prevalence of Interactive Whiteboards (IWBs) in Australian primary school classrooms, this study aimed to determine how well the teacher education course at the University of Tasmania (UTAS) was meeting the needs of pre-service teachers. Variables, including perceived usefulness, perceived ease of use, perceptions of technological complexity, technological self-efficacy, attitude towards computer use, and facilitating conditions, potentially influencing the acceptance of this technology, as described by Teo (2009), were examined, and connections between participants' perceptions identified.

This study sought to compare the IWB education received by pre-service teachers at UTAS with IWB use in primary school classrooms, with the aim of determining the readiness of beginning teachers to embrace this technology. Surveys and interviews were conducted with pre-service teachers at UTAS, Faculty of Education teaching staff at UTAS, and primary school teachers, with the results compared and interpreted in light of the existing research findings as presented in the literature review.

There was a disjuncture between how IWBs were used in primary school classrooms and how they were used at university. Pre-service teachers were on average more positive in their perceptions about IWB use than were university teaching staff. Low levels of education in IWB use and limited access to the technology were reported by the majority of pre-service teachers and Faculty of Education teaching staff. There was also a difference among expectations for IWB use of the three groups participating in this study.

The results of this study are relevant and of interest to educators and university leadership in Australia and beyond.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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DEDICATION

This dissertation is dedicated to

my family,

for their inspiration and encouragement throughout my

studies at the University of Tasmania.

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is immeasurable.

STATEMENT OF CO-AUTHORSHIP

The following people and institutions contributed to the publication of work undertaken as part of this thesis:

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Candidate was the primary author and with author 1 and author 2 contributed to the conception and design of the research project and prepared the initial draft of the complete chapter. The candidate contributed approximately 80% to the planning, execution and preparation of the work for the paper.

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STATEMENT OF ETHICAL CONDUCT

The research associated with this thesis abides by the international and Australian codes on human and animal experimentation, the guidelines by the Australian Government's Office of the Gene Technology Regulator and the rulings of the Safety, Ethics and Institutional Biosafety Committees of the University.

Marissa Jane Saville

Dated September 29, 2015

Chapter 1

INTRODUCTION

If we teach today as we taught yesterday, we rob our children of tomorrow. (Dewey, n.d.)

This study is concerned with the preparation of pre-service teachers with regard to the technical skills and pedagogical understanding needed for effective use of Interactive Whiteboard technology.

1.1 Background Information

Technology permeates modern society and few would argue against the great promise it holds for educational practices, or the benefits for both students and teachers alike (Roblyer & Doering, 2013). The application of educational technologies, such as computers, laptops, IWBs, tablets, digital cameras, virtual classrooms, and educational software, has increased daily, though its impact has not been felt as rapidly in the classroom as the way in which technology has transformed daily life at home, at work, or in both the entertainment and business worlds (Green & Sigafoos, 2007). Educational technology historian, Paul Saettler (1990, as cited in Roblyer & Doering, 2010, p. 6), suggested that educational technology has been evolving since early references to the term in the radio instructions of W. W. Charters in 1948, and usage of the term about 15 years later by audiovisual expert James Finn. As far back as 1922, Thomas Edison proclaimed that textbooks would be virtually obsolete, suggesting that the educational system would be revolutionised by motion picture technology (as cited in Cuban, 1986, p. 9). Although this prediction has not yet been fulfilled, many forms of media began to appear in schools for instructional purposes ranging from photographs, slides, films, radio broadcasting, and sound recordings in the first half of the 20th century, to television, computers, and the internet in the latter part of the century (Reiser, 2001).

In the 21st century, technology in schools has evolved to the point where it could be used in flexible ways, to "help students to understand the world in which they live as they identify, explore and analyse real-world needs, aspiration and opportunities and play an active role in matters that are relevant to them" (Australian Curriculum, Assessment & Reporting Authority (ACARA), 2012, p. 3). It has advanced beyond traditional uses of basic hardware and

educational software; instead, technology has the potential to be used by students to "develop knowledge, understanding and skills … [and] play, learn, create and produce using a range of materials, data, systems, tools and equipment through their years of schooling" (ACARA, 2012, pp. 3-4).

Although technology has the capacity to enhance student learning, there are challenges surrounding its successful implementation. The vast majority of Australian students born in the 21st century have not known a life without technology (Moyle, 2010). The multitude of ways they interact with friends on mobile devices, through the internet, and through gaming consoles has removed traditional boundaries for collaboration and provided innovative learning opportunities that are natural to them, but challenging to many adults (Betcher & Lee, 2009; Moyle, 2010). Technology affords new ways of personalising learning in ways that make learning meaningful, engaging and student-driven (Moyle & Owen, 2009); "[t]oo often teachers assume they know what children are interested in" (Green & Hannon, 2007, p. 55). This means that simply teaching old curriculum using technology is not enough; the lack of creativity and innovation surrounding technology use in some schools can make students "feel like they are stepping back in time when they go to school" (Moyle, 2010, p. 36). Not only do teachers need to embrace the idea of using technology in the classroom, the challenge is to adapt pedagogically to "student-centred teaching and learning approaches that include technologies" (Moyle, 2010, p. 4).

Schools tend to focus on the implementation of the technology as the catalyst for change, but neglect or do not realise the need to promote change within the culture of the school (Sweeney, 2008). This type of approach is less problematic for those staff members who embrace technology, but it can create a divide and leave other staff behind, and is particularly problematic when the technologically proactive staff change schools (Sweeney, 2008). Research has shown that without a shift in the thinking of teachers, little improvement in student learning due to the introduction of technology can be expected (Cuban, 2001). Cuban (1986) highlighted the immense air of interest and enthusiastic anticipation of enhanced educational outcomes that typically greeted these types of instructional innovations, but also warned of the recurrent pattern of fading interest and enthusiasm which results in a minimal impact on teaching practices. He indicated that it was notoriously difficult to successfully implement new technologies into schools as teachers tended to be "inflexibly resistant to 'modern' technology, stubbornly engaging in a closed-door policy toward new mechanical

and automated instructional aids" (Cuban, 1986, p. 2). He went on to suggest that this view was the result of many factors, such as top-down decision making processes, school policies and culture, pedagogical preferences, and the expectations of parents, administrators, and wider communities.

1.2 The Origins of Interactive Whiteboard Technology

Interactive Whiteboards (IWBs) have been heralded as a valuable teaching tool offering innumerable opportunities for increasing student engagement and learning (Campbell & Kent, 2010; Glover, Miller, Averis & Door, 2005), and are becoming increasingly common in Tasmanian primary schools. IWBs originated from a study by Stefik et al. (1987) of the Xerox PARC research laboratory which identified numerous drawbacks with the then current practice of using a blackboard in business meetings. This study found great disparity between the researchers' use of computer technology in their work practice as individuals, and the lack of technology used in group meeting situations. The limited working space offered by a blackboard was found to be problematic, and time was wasted with the inconvenience of rewriting and erasing items that needed rearranging. Items needed to be re-recorded if they were to be used at a later date, poor handwriting compounded the problematic situation, and accidental erasure was a source of great irritation. An experimental collaborative meeting room, dubbed the Colab, was set up in the early 1990s. It was equipped with six computer workstations using a distributed database connected to a single large touch-sensitive screen through a local-area network. Whilst Colab was not perfect and had numerous errors that needed rectifying, it served its purpose. It was clear that electronic whiteboards had the potential to overcome many of the disadvantages associated with a traditional blackboard, and they have continued to develop ever since (Greiffenhagen, 2000).

Although research clearly shows IWBs have the potential to transform the ways in which teachers teach (Glover et al., 2005), as with other types of technology, the potential of an IWB is not realised simply by installing it into a classroom. There is also a growing realisation that even when teachers have the intention to use IWBs as a transformative pedagogic tool, a lack of practical skills and methodological training can frustrate and impede progress (Greiffenhagen, 2000; Smith, Higgins, Wall & Miller, 2005). Furthermore, a teacher's self-efficacy towards technology can also hinder the effectiveness with which it is applied (Green & Sigafoos, 2007; Teo, 2009).

Betcher and Lee (2009) liken the recent introduction of IWBs in classrooms, to the introduction of blackboards in 1801, which was then a revolutionary teaching tool that teachers learned how to use and continued to use over the following 200 years. Although it is easy for an IWB to be seen as a new educational revolution in a technological world, it is fundamentally a catalyst. The real challenge for teachers is to develop understanding of the pedagogy and associated issues required to capitalise on the potential of this technology (Betcher & Lee, 2009). A UK report by the Joint Information Systems Committee (JISC) (2009) succinctly states, "Rather than replacing the teacher, technology has in many ways increased the focus on pedagogic skills. The art of the practitioner as instigator, designer and animateur remains key to the process of learning" (p. 5).

1.3 Previous Studies

The value of IWBs in educational settings has been widely recognised in the existing bank of literature in this field, but an underlying common thread is the notion that a teacher's educational beliefs and/or understanding of the pedagogical principles underpinning the use of IWBs may well be contributing factors to the level of efficacy with which this technology is used (e.g. Glover et al., 2005; Kennewell & Higgins, 2007; Moss et. al., 2007). Gahala (2001) provided a rationale for this argument, for in his view the provision of technological equipment in a classroom "is not transformative on its own" (p.13), but is dependent upon the knowledge, skill and attitude of teachers (Cenzon, 2008). A similar opinion was presented by Jewitt (2006), who specifically argued that it is people's use of technology that produces change: "Introducing a new technology into the classroom, like interactive whiteboards for example, does not necessarily change the social relations, it does not 'make' the classroom interactive" (p. 143). It was Jewitt's (2006) belief that virtually all students and teachers will tend to use a new technology in a manner that aligns with previous classroom practice when it is first brought into an existing classroom context, and that it requires a pedagogical shift before new practice supersedes the old. Examples of this situation in context would include teachers using an IWB as a screen for data projector images, or teachers continuing to use a whiteboard adjacent to an IWB rather than using the IWB for this purpose (Jewitt, 2006).

This leads to other recent research which emphasised the need for further study into the manner in which teachers are prepared for using this technology in the classroom during their teaching education course (Campbell & Kent, 2010). Indeed, it would seem there are ample

resources for attending to this need, as the Australian Minister for Education dedicated A$40 million dollars in 2010 for improved education for pre-service teachers and professional learning for current teachers, to improve their ability to use technology in ways that improve and enrich student learning (Gillard, 2010). Hence, it is important that all teachers, both practicing and pre-service, be educated in the effective use of IWBs, the pedagogy underpinning this technology, and on how to incorporate this technology effectively into their teaching practice.

1.4 Aim of the Research Project

The aim of this research project was to discover how well prepared the pre-service teachers enrolled in the Bachelor of Education course at the University of Tasmania (UTAS) are for teaching with IWBs. In addition, links were examined between these pre-service teachers' practical IWB skills, their self-efficacy with this technology, and their understanding of relevant pedagogy. The identification of other influential factors, including the extent to which UTAS Education staff use IWBs in their teaching programs, was sought and investigated. This project also considered the level of pre-service teacher preparation for teaching with IWBs by comparing their ideas with existing practices in a sample of local schools.

1.5 Research Questions

The research questions that directed the focus of this study were:

1. What is the nature and extent of preparation of the pre-service teachers enrolled in the Bachelor of Education course at UTAS for using IWBs as a teaching tool?
2. What is the nature and extent of IWB education received by teachers at a selected local Tasmanian primary school and how do they incorporate IWBs in their teaching practice?
3. What is the nature and extent of education regarding IWB use as a teaching tool received by UTAS Education teaching staff and how do they incorporate IWBs in their teaching practice?
4. What has influenced these pre-service teachers, primary school teachers, and UTAS Education teaching staff, with regard to their use of IWBs in their current teaching practice?

1.6 Researcher's Stance

I am employed as a learning technologies teacher in a Tasmanian primary school, and have taught in this capacity since 2005. IWBs are an increasingly common sight in Tasmanian primary schools, and I believe they have enormous potential as a teaching tool. My own experience with this technology leads me to believe that in order to be truly effective, the teacher must have practical IWB skills, pedagogical understanding, a positive attitude to technology, as well as imagination and creativity. Furthermore, I believe that the conditions surrounding IWB use must be conducive to maximise potential. I am concerned about the loss of opportunity for student learning due to teachers who find themselves in the position of having an IWB installed in their classroom, but lack the skill or confidence to use it.

In no way am I suggesting that teachers in this unfortunate situation are to blame. I am very aware that it takes time, money, and opportunity to gain the skills needed to use IWBs, and that it can be quite nerve-wracking to use such a visible technology in front of a class of technologically literate students. I believe that universities are well-placed to help our future teachers master this truly engaging teaching tool that so easily can capture the interest of students, engaging the senses of learners, whether they are visual, kinaesthetic, aural, or so on. Indeed, I would argue that teacher education must address this issue to enable teachers to harness the potential of this technology, but if university teaching staff themselves do not know how to use one, then how do we move forward?

My own teacher education as a mature-aged student was completely free of anything related to IWBs. To my knowledge, they did not exist in the university at that point in time. As such, I was completely unprepared for the IWB that awaited me in my first teaching appointment. I still remember looking at the IWB wondering what on earth I was going to do with it. Since then, I have participated in several professional learning sessions when external experts have visited the school. Even more valuable to me, have been the opportunities to share and learn from my colleagues.

I completed high school in 1984. Because the first IWB was not built until the 1990s, there was clearly no chance of me drawing upon past experience to assist my efforts in utilising this technology. This is not, however, the case for many of the current generation of pre-service teachers, or even for many practicing teachers in Tasmania today. I wonder how much of an influence the experiences of people as students using an IWB will impact on their

use of IWBs as a teacher. The current generation of teachers entering the profession could be expected to be more technologically inclined than previous generations.

As a result of my musings and experiences, it is little wonder that I am extremely interested in pursuing the nature and extent of preparation pre-service teachers receive during their teacher education course at university for using IWBs as a teaching tool. There is a tendency for people to teach in ways that they themselves have been taught. Hence, I am interested in learning more about the perceptions of pre-service teachers, primary school teachers, and university teaching staff regarding their education with and use of IWBs. These are the key elements underpinning the study and it is my hope that analysis of the data will identify solutions to this conundrum.

1.7 Significance of this Research

The rationale for my beliefs about the importance of holistic education in the use of IWBs as a teaching tool was explained in Section 1.6. I have also outlined my concerns for teachers trying to use this technology without proper preparation. My concerns were echoed by Campbell and Kent's (2010) research, for they noted that how a teacher teaches has a big impact on student learning, and as such, argued that teachers should be educated on how to use IWBs effectively as part of their teacher education course.

The implementation of IWBs into Tasmanian primary schools is clearly a signal by the Department of Education encouraging teachers to use these as a teaching tool. Indeed, many Australian primary schools have an implementation program in place (Campbell & Kent, 2010). Thus, I was interested to find out how well prepared for IWB use the pre-service teachers enrolled at UTAS perceived themselves to be.

There have been many studies into the value of IWBs in the classroom, but very few have considered the role played by teacher education courses. Having reviewed the literature, none have looked at this issue from a Tasmanian perspective.

It is my belief that the lessons learned from the results of this study are likely to have relevance to other technologies currently being used in schools today. It is also likely that these lessons will be relevant to the implementation and use of whatever the next potentially revolutionary technology may be in the future.

1.8 Structure of the Dissertation

Chapter 1 of this thesis focused on describing the background information relevant to this study. Information regarding previous studies that were related to the nature of this research was included, as was the aim of this research project. Four research questions were posed, the significance of this research was considered.

Chapter 2 presents a comprehensive literature review of published research related to the topic, as well as other relevant studies that provided the structural basis of this thesis.

Chapter 3 provides an outline and justification for the research design and methodology employed in this study.

Chapter 4 of this study is a presentation of the survey results gathered from 165 participants comprised of 145 pre-service teachers, 18 university teaching staff, and 2 primary school teachers.

Chapter 5 provides a detailed account of the results of the 21 semistructured interviews that were conducted as part of this study.

Chapter 6 is a final discussion and draws the conclusions of the study.

Chapter 2

LITERATURE REVIEW

> *The real challenges for teachers at this point in the development of digital classrooms are to see the great potential that lies ahead, to master the tools and the mindset to begin claiming that potential, and to collaborate with their colleagues and students to effectively use these new tools for teaching in a digital world. The IWB has all the characteristics for being a potent tool in this educational shift. (Betcher & Lee, 2009, pp. 1-2)*

2.1 Introduction

This chapter presents a review of the relevant literature underpinning this study. It begins by providing an overview of IWBs (Section 2.2), considers the role of IWBs in education (Section 2.3), addresses the technological know-how needed to effectively operate an IWB (Section 2.4), and examines relevant pedagogy (Section 2.5). The next section (Section 2.6) and its subsections review the stages in teachers' IWB use according to Goodwin's (2011) framework. The notion of instrumental genesis (Guin & Trouche, 1998), with regard to IWB use, is presented in Section 2.7, followed by technology acceptance theories (Section 2.8). Factors influencing teachers' progression in IWB use are considered (Section 2.9) starting with relevant theoretical frameworks. Teo's (2009) technology acceptance research is then used as a lens for an in-depth examination of six variables: Perceived usefulness (Section 2.9.1), perceived ease of use (Section 2.9.2), perceptions of technological complexity (Section 2.9.3), technological self-efficacy (Section 2.9.4), attitude towards computer use (Section 2.9.5), and facilitating conditions (Section 2.9.6). The idea of a subjective norm, which was acknowledged in later research by Teo (2011), is also reviewed (Section 2.9.7). The use of IWBs in pre-service teacher education is considered (Section 2.10) and is then followed by a review of IWB use in three Australian primary schools (Section 2.11). A brief summary concludes the chapter (Section 2.12).

2.2 What is an IWB?

An IWB (also known as an electronic or digital whiteboard) is typically a large, white, touch-sensitive board designed to replace the traditional blackboard or whiteboard. It has been described as a "digital hub through which other technologies can be channelled" (Warwick, Mercer, Kershner & Staarman, 2010, p. 350), and has the capacity to display and respond to a

wide range of projections, internet resources, and software applications through its connection to a data projector and computer.

IWBs can be either fixed in a permanent, prominent position, or free-standing for mobility. There are many different brands that use different types of technology. Some use a flexible, "analogue resistive membrane technology" (Betcher & Lee, 2009, p. 26) with a fine mesh of contact points that detect pressure and relate directly to the computer's screen pixels. Others use "electromagnetic pick up technology" (Betcher & Lee, 2009, p. 27), which registers the position of a stylus via a grid of electronic sensors set into a hard surface. There are also ultrasonic and infrared tracking technology systems (Betcher & Lee, 2009, p. 29). This list is not comprehensive, however all are either operated by a special pen or stylus, or by a single finger touch, some by either a pen or finger, and some can respond to two touch points at once. The position of the data projector varies from a direct attachment to the top of the IWB, to a position several metres away, and may be fixed in position or free standing. The position of the data projector and where the classroom is situated affect how frequently the IWB requires calibration, or realignment of the data projector in relation to the IWB. It is also possible to operate a virtual whiteboard through the use of an interactive projector which recognises the position of an infra red pen on a surface. EBoards, also known as interactive flat panel displays, are a newer but closely related technology that feature a high resolution, flat panel, back lit, Liquid Crystal Display (LCD) touch screen that closely resembles a large black plasma television. Problems with user shadows and varying lighting conditions that often affect the ease of use of IWBs are negated, as is the need for calibration. Depending on the size, brand and software, these may respond to either single or dual touch. For the purposes of this review eBoards/interactive flat panel displays are encompassed by the term, IWB as the pedagogical principles and technological skills are very similar (Goodson-Espy & Poling, 2015).

2.3 IWBs and Education

The potential of IWBs as teaching tools arises from the myriad ways they provide to "view manipulate, create and distribute electronic teaching and learning resources using familiar computer applications … [and] connect to desktop and networked computers, combining the functionality of audio-visual presentation and computer-based interactivity" (Bennett & Lockyer, 2008, p. 289). Hartson (2003) conceptualised these types of visual, auditory and

tactile human-computer interactions as cognitive, physical, sensory, and functional affordances. Kennewell (2005) considered IWB's resources to be multimodal texts, which can be modelled and shaped using the interactive features of the board. IWBs can be viewed as a generic classroom tool, but when linked to the internet, "it is an unrestricted portal for interaction with an infinitely wide range of secondary digital resources … offer[ing] teachers tremendous ease and flexibility in sourcing materials to stimulate dialogue" (Hennessy, 2011, p. 467). IWBs are often sold with specialised software packages; however there are countless generic software, multimedia and online applications. Other accessories include speakers, slates or tablets, wireless graphic pads or other mobile technologies, printers, document cameras, and interactive response systems.

By June 2011, over 3.6 million IWBs were installed across 66 developed countries worldwide; this figure rose to over 7 million in schools by 2015 (Messenger, 2015). In 2013, 1.4 million IWBs were purchased worldwide for educational purposes (Futuresource Consulting, 2014). Globally, the number of IWB technologies continues to grow; in 2014 over AUD$7 billion was spent on IWBs, eboards, projectors, and related attachment devices (Futuresource Consulting, 2015). The United Kingdom government has spent over AUD$76 million on IWBs for schools (Armstrong et al., 2005), and as a result, over 90% of classrooms have been equipped with IWBs (Futuresource Consulting, 2013, as cited in Orbaugh, 2013). In 2015, 60% of Australian classrooms had some form of IWB (Messenger, 2014, as cited in Lee, 2015). The governments and other bodies providing the funding for this technology appear to do so under the assumption that students will benefit from its use (Glover, et al., 2005; Slay, Siebörger & Hodgkinson-Williams, 2008).

IWBs are becoming a regular part of the technological toolkit available to teachers, however many teachers resist embedding the technology into their teaching (Betcher & Lee, 2009). To use an IWB, teachers must make the intentional decision to use it, but how they use it depends upon what they know about IWBs, their technological skills, and their pedagogical approach (Murcia, 2014). Teachers need both the technological know-how, and the appropriate pedagogy, to reap the benefits of IWBs in classrooms (Goodwin, 2011).

2.4 IWBs and Technological Know-How

Describing IWBs as a valuable teaching tool, a recent Australian study concluded that teachers must have adequate operational competency and sufficient technical know-how to be

"competent and effective users of IWBs" (Campbell & Kent, 2010, p. 447). Although the installation of IWBs into classrooms was met with great enthusiasm (Kennewell, 2006), other research found that a lack of skill and education regarding basic trouble shooting of IWB issues caused a negative impact on teaching and learning (Beauchamp, 2004; Levy, 2002; Şad, 2012; Smith et al., 2005). Lack of technological skill may include the inability to calibrate an IWB, being unable to connect peripheral items such as a wireless tablet or digital microscope, or other inadequate basic trouble-shooting skills, such as being unable to check that everything is plugged in properly. These types of issues are time-wasting and frustrating for both students and teachers (Levy, 2002). According to Beauchamp's (2004) case study of the implementation of IWBs into a primary school, these sorts of issues can be alleviated by gradually building up teachers' technological skills. Beauchamp's (2004) findings also suggested that the development of basic "mechanical skills" (p. 330) was a necessary step for teachers to take if they were to further develop their IWB skills.

Cuthell (2003) reported that teachers with strong technological skills were the most enthusiastic and keen IWB users. Unfortunately practical technical issues beyond a technologically knowledgeable teacher's reach, such as networking problems, intermittent wireless access, slow logons and problematic IWB-dedicated pens and other hardware items, are still likely to occur (Levy, 2002). A reliable and readily available support network is vital (Campbell, 2010), as there is evidence that technical support is a major concern for both students and teachers (Levy, 2002), leading to a negative impact on teaching efficiency (Smith et al., 2005).

2.5 Pedagogy

The provision of an IWB in a classroom does not determine the pedagogy of the teacher (Tanner, Jones, Kennewell & Beauchamp, 2005), nor does it guarantee that a pedagogical transformation will take place (Sweeney, 2008). In addition to adequate technical skills, teachers need pedagogical understanding of effective IWB usage if they are to become effective users themselves (Campbell & Kent, 2010; Jones & Vincent, 2010; Murcia, 2014). There are numerous factors that shape teachers' pedagogy, including personal traits, background experience, knowledge, the students, available resources, the school culture, and curriculum requirements (Kennewell, 2006). IWBs make it possible to capitalise on a wider range of teaching materials than ever before, integrating web-based resources, multi-media,

and text and images to create dynamic, interactive and inspiring learning experiences (Campbell & Kent, 2010). IWBs, however, merely provide the medium for interactive learning and rely on the teacher for the degree and manner in which interactivity is afforded: "Teachers are critical agents in mediating the software; the integration of the software into the subject aims of the lesson and the appropriate use of the IWB to promote quality interactions and interactivity" (Armstrong et al., 2005, p. 468). IWBs do not instantly change the way a teacher teaches; in fact, it is typical for the interactivity of this technology to be lost at first (Jewitt, 2006). Initially, the board is typically used in a manner that is reminiscent of regular whiteboard use, and the projector used in typical projector/screen fashion; indeed, it is not uncommon to find an IWB standing alongside a regular whiteboard (Campbell & Kent, 2010; Jewitt, 2006). When IWBs are not used in an interactive manner, the result may be a reinforcement of a didactic teaching approach (Gillen, Staarman, Littleton, Mercer & Twiner, 2007; Kennewell, 2006; Knight, Pennant & Piggott, 2004; Levy, 2002).

One of the main pedagogical implications of having an IWB in the classroom, is the opportunity it provides teachers to plan learning experiences, especially with regard to "*what* is done and *who* does what [*sic*]" (Jewitt, 2006, p. 143). When treated as a teaching tool to be manipulated only by the teacher, rather than as a learning medium for students to interact with, IWBs can become a technology for supporting a teacher-centred pedagogical approach (Goodwin, 2011; Hall & Higgins, 2005). In classrooms where students are permitted to interact with IWBs, but the task requires lower-level thinking and results in cognitive passivity, opportunities for deeper learning are lost (Way et al., 2009). Research has shown that "the use of technology as an adjunct, rather than as an integrated element in teaching, minimises interaction and the matching of teaching to the learning needs" (Greiffenhagen, 2000, p. 1). Furthermore, it is critical to understand that students may not necessarily be cognitively engaged simply by viewing or touching images, animations or videos projected onto an IWB; teaching strategies need to be carefully considered to optimise student learning (Goodwin, 2011). When a teacher's pedagogy, however, is student centred and aligns with harnessing the interactive capacity of an IWB, "the potential for the IWB to transform pedagogy is revealed" (Tanner et al., 2005). Some examples of strategies that engage students in higher level thinking when using an IWB include creating tasks that facilitate group work and encourage meaningful discussion between students, using multimedia

resources to develop interactive challenges based on real-world contexts, or using questioning techniques in conjunction with learning sequences on the IWB (Goodwin, 2011).

2.6 Stages in Teachers' IWB Use

Drawing upon the theoretical frameworks put forward by Beauchamp (2004), Glover, Miller and Averis (2004), and Sweeney (2008), Goodwin (2011) defined a continuum of user level competencies that teachers exhibit in their pedagogical use of IWBs as they move from a teacher-centred to a student-centred approach to learning. The framework is comprised of five stages, those being 'substitution', 'accommodation', 'exploration', 'interaction', and 'advancement' (Goodwin, 2011). This framework may provide a guide or self-assessment tool for teachers wishing to harness the potential of IWBs as a teaching tool that will engage students cognitively and maximise learning opportunities, or for schools looking at IWB related professional learning. It describes the ways in which an IWB may be used, with regard to both the technological competence required to support a teacher's growing confidence and skill, and the pedagogical transformation required to capitalise on the opportunities presented by this technology. It should be noted that teachers may exhibit overlapping characteristics from different stages of the continuum, as their skills are developing. The five stages identified by Goodwin form the framework for this section of the review with each discussed in turn in the following subsections.

2.6.1 Substitution

The initial 'substitution' stage is typified by lecture style, teacher-directed learning with very limited questioning opportunities afforded to students. Teachers in this stage almost universally view the IWB as a replacement for a black/white board, and use it in a familiar, whole class teaching approach (British Educational Communications and Technology Agency (BECTA), 2007), essentially doing old things in new ways (Prensky, 2005). This is a natural step, as virtually all Australian primary school teachers have used either a black or whiteboard extensively as a teaching tool. The ways in which IWBs are used may be influenced by the teacher's lack of confidence in their technological skills (Compeau & Higgins, 1995). Two examples of the whiteboard replacement phase are using specialist IWB software to "write up class agendas on blank pages using native interactive whiteboard software (without saving), and using the projector to display weekly spelling lists typed legibly using a Word processing program" (Sweeney, 2008, p. 26). Teachers in this stage

consider the main benefits of IWBs to be better lesson presentation, time saved in clearing the board between lessons, lesson pace, and software that enables text recognition. It is not likely that teachers will prepare lessons integrating IWBs in advance at this stage, nor are they likely to share resources with their peers (Betcher & Lee, 2009). Nevertheless, there are still numerous benefits to student learning, as students exhibit higher motivational levels, they appear more engaged, and they perceive lessons as more interesting because they contain greater variety (BECTA, 2007). In this substitution stage, it is important for teachers to become competent at using the basic operating software on their IWB, as well as becoming comfortable using a stylus or finger to replace a mouse (Goodwin, 2011; Sweeney, 2008). Such familiarity is vital to support a pedagogical change and avoid the "inherent danger that the IWB becomes an information presentation platform, rather than another resource for developing questioning and interactive learning" (Beauchamp, 2004, p. 333). To progress from substitution status, Beauchamp (2004) contended that a pedagogical shift in teaching style is required, which is most readily achieved by teachers who willingly choose to invest their time, energy and effort into enhancing both their teaching style and technological skills.

2.6.2 Accommodation

As teachers begin to include more opportunity for student questioning into their teaching style, they move towards the 'accommodation' phase of Goodwin's (2011) continuum. This phase is still primarily based on lecture-style teaching, but also incorporates the use of pre-made resources for display purposes, and teachers start to plan with and use features of the 'native' IWB software as a "visual support and organisational tool" (Sweeney, 2008, p. 27). The skills developed in the substitution stage are applied more readily, and some of the basic interactive software tools such as highlighting or drag and drop, are incorporated into lessons (Goodwin, 2011; Sweeney, 2008). Teachers may also integrate simple interactive websites, multimedia resources, clip art or other graphics for decoration, or external software programs, such as Microsoft PowerPoint, into lessons (Beauchamp, 2004; Goodwin, 2011). The teacher is generally still the dominant user of the IWB at this stage, and the students are generally exposed to the same lesson at the same time and pace, which is set by the teacher (Sweeney, 2008). Although teachers are often apprehensive about the time requirements of planning more extensive use of the IWB, and also about how to use the technology in meaningful ways, experimentation with the IWB gradually eases this concern as they develop confidence and start to realise the possibilities afforded by this technology and they start to include

opportunities for students to interact with the IWB (Beauchamp, 2004; Sweeney, 2008; Zevenbergen & Lerman, 2008).

The development of file management skills and confidence in locating and using online resources are two characteristics of the accommodation stage (Beauchamp, 2004). Both students and teachers use and understand terminologies consistent with an IWB related vocabulary (Beauchamp, 2004). Significantly, not only does the teacher's technical ability improve, but their teaching role becomes more dynamic as it changes to that of a facilitator; their interactions with students evolve noticeably to provide learners with greater responsibility for their learning (Harris, 2002).

2.6.3 Exploration

For teachers, the 'exploration' stage of Goodwin's (2011) continuum is signified by a comfortable familiarity when using the IWB. Up to this point, the challenge of mastering the IWB most likely hid its immense benefits, but now the IWB has become a routine teaching tool that teachers have come to rely upon, which causes frustration when it is unreliable (Beauchamp, 2004; Sweeney, 2008). Teachers' technical competence is further developed as they begin to exploit more of the interactive IWB software tools, such as the spotlight, or rub and reveal, to support their lessons (Goodwin, 2011). Teachers learn to adapt IWB software resources and lessons made by others, and include more extensive use of hyperlinks to a variety of multimedia and online resources (Goodwin, 2011). Although the way in which the IWB is used is still determined by the teacher, more student-centred learning is evident through a mix of whole and small group use, though the teacher and students use the IWB at separate times. Student work may also be displayed, and ideas shared visually (Goodwin, 2011; Sweeney, 2008). The exploration stage is critical to the ongoing development of a teacher's changing pedagogical practice, for it is at this time a genuine commitment to becoming an expert at using an IWB is either forged or halted (Sweeney, 2008). To this point, any pedagogical change may have been predominantly subconscious, however there is little doubt that a conscious "mind shift from a behavioural to a cognitive view of learning supports this 'breakthrough'" (Sweeney, 2008, p. 25). This type of pedagogic change relies upon genuine understanding of the importance of interactivity between teachers, students, and IWBs as a tool for learning (McCormick & Scrimshaw, 2001). Support through this stage is critically important. The transition to the next stage is much easier for teachers who

are competent computer users, who have unlimited access to an IWB, and who can access the software on laptops they can utilise from home at their leisure (Sweeney, 2008).

2.6.4 Interaction

'Interaction' is the next IWB user competency level, as defined by Goodwin (2011). Using an IWB at this stage is a student-centred, collaborative endeavour between students and teacher, and it may be used by individuals or by mixed groups of varying sizes (Goodwin, 2011). It is signified by advanced software integration, purposeful overlaying of various objects, and capitalising on an assortment of interactive techniques, embedded objects, multimedia, and peripheral devices such as digital and video cameras, digital microscopes, a visualiser (hovercam) and voice recorders (Goodwin, 2011; Sweeney, 2008). Not only is students' work shared through the IWB, but the IWB is used as a conduit to annotate and record editing comments. Furthermore, discussion surrounds concepts demonstrated on the IWB as ideas are explored extensively through various digital representations (Goodwin, 2011). A high level of technical competence and understanding of how IWBs can support students' learning through responsive interactive experiences and sustained questioning is displayed by teachers in this phase (Sweeney, 2008). Learning experiences are authentic, use real time information, and are differentiated to meet different students' learning needs to increase student involvement and engage interest (Sweeney, 2008).

2.6.5 Advancement

The highest level on Goodwin's (2011) continuum is that of 'advancement'. The skills that have been gradually developed at earlier levels are further enhanced to the stage where a teacher consistently demonstrates an outstanding "repertoire of technical skills … seamlessly integrat[ing] a range of software applications, proprietary software and Web 2.0 technologies (such as blogs, wikis and podcasts)" (p. 3). The technology is used to support spontaneous learning opportunities, with student work and learning sequences digitally recorded using IWB software for retrieval, reflection, and continuation at later stages (Goodwin, 2011). Hyperlinks may be used to revisit or revise prior lessons, or to link to student work samples, annotated items, or other useful artefacts (Beauchamp, 2004; Hennessey, 2011). As such, the available resources are continuously evolving, providing a visible record of students' learning

journeys (Hennessy, 2011, p. 463). Peripheral items, such as slates, digital microscopes, scanners or voting hardware, are regularly incorporated into lessons (Beauchamp, 2004).

In the advancement stage, a completely student-centred pedagogy has become the norm, with the interactive potential of IWBs purposely used to develop students' higher-order thinking skills (Goodwin, 2011). An interactive pedagogy is critical for stimulating higher-order learning (Kennewell & Beauchamp, 2007; Sweeney, 2008), and is supported by high levels of teacher creativity (Cuthell, 2003). In addition, the teacher's pedagogy reflects outstanding understanding of how students learn, and they can verbalise how IWBs can enhance learning, and "show ingenuity in developing materials to meet specific learning needs with much more evident differentiation of tasks" (Miller, Glover & Averis, 2004, p. 7). Hennessy (2011) viewed the IWB as a tool for initiating and sustaining classroom dialogue, stating that:

> This powerful and increasingly prevalent technology opens up opportunities for learners to generate, modify, and evaluate new ideas, through multimodal interaction along with talk ... dialogue that highlight[s] differences between perspectives, and make[s] ideas and reasoning processes more explicit. (p. 463)

In this final phase, students have the power to direct how the IWB is used, meaningful connections are made between curriculum areas, and learning experiences are based on authentic, real world contexts (Sweeney, 2008). IWBs provide collaborative opportunities for students to "express, explain, justify, evaluate, and reformulate ideas – both orally and using other rich symbolic representations" (Hennessy, 2011, p. 476). As the result, a teacher in this phase of the continuum can make learning experiences truly vivid (Warren, 2003), through flexibility, versatility, and dynamic content that adapts easily to the learner's needs (Campbell & Kent, 2010).

Goodwin's (2011) IWB framework highlighted the need for teachers to develop both technological capacity and pedagogical skills, which ultimately can result in instrumental genesis (Guin & Trouche, 1998).

2.7 Instrumental Genesis

The process of transforming an artefact or object, into an instrument, whereby the user develops understanding of the limitations, resources and applications of the artefact, is described by Guin and Trouche (1998) as instrumental genesis. This adaptive process has been explained as the building of utilisation schemes, or "'stable mental organisation'

including both technical skills and supporting concepts" (Drijvers & Gravemeijer, 2005, as cited in Bretscher, 2009, p. 1341). Thus, when a teacher is given an IWB to use, it is initially a tool; however, it becomes a teaching instrument once their pedagogy has evolved and the technological skills have been mastered. The speed with which this complex transformation takes place varies between individuals, but is worth pursuing, for at this point, the user is able to reflect on, and develop, its use (Guin & Trouche, 1998).

2.8 Technology Acceptance Theories

Since the 1970s, when it was realised that technology was not used in educational contexts to the extent that had been anticipated, there have been many attempts to understand causal factors (Compeau & Higgins, 1995). For example, the application to this context of Fishbein and Ajzen's (1975) theory of reasoned action, suggests that teachers would be more prepared to use IWB technology if they understood the related benefits. The idea that an individual's perceptions are critical to the effective adoption of technology innovations (Bill, 2003) is also relevant to the adoption of IWBs in classrooms. It is important to recognise that innovations are likely to be interpreted in different ways by different people (Weick, 1990); in the context of this study, it means that the value and potential of IWBs will be perceived differently by different teachers. Likewise, Bill (2003) emphasised that an individual's background experience and belief systems also contributed to their attitude towards technology. This means that different attitudes to IWB technology should be expected from different teachers because all individuals have accumulated a unique combination of life experiences. Bandura's (1986) social cognitive theory identified self-efficacy as being influential on an individual's behaviour. In this context, self-efficacy refers to an individual's beliefs about their ability to use IWB technology (Rosenfeld & Martinez-Pons, 2005). Building upon the earlier theory of reasoned action, Ajzen (1991) developed the theory of planned behaviour, in which perceived behavioural control was considered to be an influential factor on behaviour. Applied to this context, it refers to the level of ease or difficulty a person perceives the use of an IWB to be.

According to McCoy, Galletta and King (2007), one of the most widely used theoretical frameworks for examining behavioural models related to technology use was created by Fred Davis in 1985. In developing his Technology Acceptance Model (TAM), Davis (1985) drew upon Fishbein and Ajzen's (1975) theory of reasoned action, paying particular attention to

how the variables of perceived usefulness and perceived ease of use, related to a user's level of technology acceptance. Other research acknowledged the value of the TAM framework, and the improvements contained in the later version, TAM2 (Venkatesh & Davis, 2000), but suggested it was limited in breadth, missing variables related to "both human and social change processes" (Legris, Ingham & Collerette, 2003, p. 191). Likewise, Dishaw and Strong (1999) suggested that the TAM framework would have greater external validity if it also probed various types of influential factors and the context in which the technology was being applied.

2.9 Factors Influencing Teachers' Progression in IWB Use

Teo (2009) developed a technology acceptance model for educational research purposes based on the theoretical groundwork of Davis (1985), which identified key variables that may influence a teacher's technology use. This model has been used in this study for the purpose of identifying influential variables that have influenced teachers' progression through the stages of IWB use, as described by Goodwin (2011, Section 2.6). In applying Davis' (1985) TAM to educational research, Teo (2009) found that teachers had greater independence and choice over how technology was used than did the users in a business context for whom the model was originally intended. He also acknowledged the validity of other research findings that identified attitude towards computer use, technical complexity, and facilitating conditions (such as professional learning and school culture) (Thompson, Higgins & Howell, 1991), as well as self-efficacy (Compeau & Higgins, 1995), as important variables in determining technology acceptance. Thus, Teo's (2009) educational technology acceptance model focused on numerous interacting variables that have the potential to influence the degree to which a teacher chooses to integrate technology into their teaching practice. These key variables are explored further in the following Sections: Perceived usefulness (2.9.1), perceived ease of use (2.9.2), perceptions of technological complexity (2.9.3), technological self-efficacy (2.9.4), attitude towards computer use (2.9.5), and the facilitating conditions (2.9.6). Later research by Teo (2011) recognised the impact of a subjective norm on technology acceptance, which is reviewed in Section 2.9.7, and included as a potentially influential variable in this study. Investigation and raised awareness of these factors is worthwhile, for as Sweeney (2008) warned, the longer teachers remain in the earlier stages of IWB use, "the more entrenched the interactive whiteboard will become into their existing traditional practice" (p. 26). Likewise, other research suggested that without progression in

technical and pedagogical skills, it is possible that "the technology will lose its novelty value and teachers will revert to conventional methodology" (Glover & Miller, 2001, p. 257).

2.9.1 Perceived Usefulness of Technology

Increasing teachers' perceptions of the usefulness of IWBs is central to its successful implementation (Sparrgrove, 2009). According to Davis (1989), perceived usefulness is "the degree to which a person believes that using a particular system would enhance his or her job performance" (p. 320). Research has identified a direct link between people's use of technology and their perceptions of the likelihood of positive results from its use, even though care and consideration had been given to its implementation (Davis, Bagozzi & Warshaw, 1989; Robey, 1979; Zevenbergen & Lerman, 2008). Perceptions of IWBs' usefulness depend on a teacher's needs and skill level; it can be perceived purely as a useful classroom management tool, a whole class teacher-centred teaching tool, or merely a convenient projector screen. Thus, when a teacher perceives that the interactivity afforded by IWBs is useful to enhance student learning, the potential may be realised; however, if it is viewed only as a presentation medium, the interactivity may be lost (Armstrong et al., 2005). Specific modelling and promotion of the potential benefits to teachers for student learning is important to positively influence teachers' perceptions of the usefulness of IWBs (Sparrgrove, 2009). To appreciate the usefulness of IWB technology, teachers need to be exposed to the flexible and versatile nature of IWBs, its capacity to engage and motivate students with a range of learning needs and learning styles, and how it can efficiently support teacher planning (Smith et al., 2005). Furthermore, IWBs should be introduced in a non-prescribed manner to open teachers' minds to the infinite ways the technology can be useful (Sparrgrove, 2009). Because teachers have different needs, technological abilities and pedagogical approaches, they are likely to perceive different levels of usefulness from such exposure and disregard excessive information; hence, gradual introduction is recommended (Sparrgrove, 2009). The perceived usefulness of technology can be positively increased by enhancing perceptions about the ease of using technology (Brazer, Sparrgrove & Garvey, 2005; Davis, 1989).

2.9.2 Perceived Ease of Use of Technology

Davis (1989) defined perceived ease of use of technology as "the degree to which a person believes that using a particular system would be free of effort" (p. 320). The effort a person

exerts when taking on a task relates to their perception of what is required to accomplish the task (Russo & Dosher, 1983, as cited in Sparrgrove, 2009). When choosing between tools requiring different levels of effort, Davis (1989) contended that it is more likely that a person will select the easier option. Although IWBs are relatively easy to use (Bennett & Lockyer, 2008; Campbell & Kent, 2010), they appear to be technologically complex, and the effort required to master the operational and troubleshooting skills may impact in a negative manner on a teacher's perceptions of how easy they are to use (Sparrgrove, 2009). However, the negative impact of initial perceptions of IWBs being difficult to use is likely to decrease over time (Davis et al., 1989), particularly with ongoing education and support (Sparrgrove, 2009). Smith (2000) reported widespread teacher enthusiasm and recognition of how easy IWBs were to use during carefully orchestrated professional learning sessions. Permanent installation would mitigate many of the difficulties that are associated with using IWBs, such as issues caused by the need for setting up the technology, and time wasted blacking out windows to remove lighting problems. Although perceived ease of use of technology is important, there is evidence to suggest that users are willing to work through difficulties if their perceptions of the usefulness of the technology are strong enough, whereas if users perceive technology to be easy to use, but not useful, it is extremely unlikely to be used (Davis et al., 1989).

2.9.3 Perceptions of Technological Complexity

Studies have shown that perceptions of how easy technology is to use are generally reduced when technological complexity is perceived (Lin & Lu, 2000; Park, 2009; Teo, 2009; Thompson et al., 1991; Thong, Hong & Tam, 2002). Rogers and Shoemaker (1971) defined complexity as "the degree to which an innovation is perceived as relatively difficult to understand and use" (p. 154). The greater the complexity, the less likely it will be used (Thompson et al., 1991). The complexity may be regarding any one, or combination of, a technology's relevance, ease of navigation, or accessibility (Thong et al., 2002). Thompson et al. (1991) suggested that perceptions of technological complexity may be partially controlled through professional learning designed to counteract this issue, and by collegial modelling, both of which may also exert a positive impact on the actual use.

2.9.4 Technological Self-Efficacy

According to Bandura (1997), self-efficacy is "concerned not with the number of skills you have, but with what you believe you can do with what you have under a variety of

circumstances" (p. 37). Although they are sometimes used interchangeably and are certainly related to each other, the terms self-efficacy and self-confidence are not exactly the same thing. Self-confidence is the level of a person's belief in their aptitude for a given task, whereas self-efficacy draws on levels of confidence to determine the capability to attain a specific outcome (Bandura, 1997). Self-efficacy is an important component of social cognitive theory that interacts with other variables, influencing thought, motivation, effort, persistence, choices and action (Bandura, 1997). Strong self-efficacy promotes the application of skills, increasing the likelihood of success, whereas self-doubt weakens a skill set and may result in frustration and the lowering of self-assurance in tackling further tasks (Compeau & Higgins, 1995; Teo, 2009). Self-efficacy is the sum of knowledge structures that are developed through observation, exploration, verbal and written instruction, and analysis and synthesis of these learning experiences, which are then practiced to develop skill proficiency (Bandura, 1997). It follows that technological self-efficacy is a person's belief in their ability to use technology to complete a task, and is an accumulation of prior experiences with technology (Compeau & Higgins, 1995). Extremely poor self-efficacy may result in technophobia, which is a condition that can result in mild to severe discomfort, anxiety, and negative feelings when using or contemplating using technology (Rosen & Weil, 1992, as cited in Gülseçen & Kubat, 2006).

Beauchamp (2004) stressed that teacher confidence with technology is an essential prerequisite for using IWBs. Indeed, research has shown that self-efficacy is likely to influence a teacher's use of technology and their self-confidence in integrating technology into their classroom practice (Albion, 2003; Bandura, 1997; Compeau & Higgins, 1995; Hsiung, 2002; Paraskeva, Bouta & Papagianni, 2008). Teachers with a strong sense of technological self-efficacy are more likely to embrace IWBs as an important educational tool than their counterparts with low self-belief in their aptitude to use technology (Hsiung, 2002). McCoy's (2010) study examining the link between technology proficiency and levels of technological self-efficacy uncovered a significant relationship between participants with access to technology at home and those with positive self-efficacy. Other research suggested that age may be a contributing factor: "Teachers who have been in the field for more than 10 years often do not have the expertise to use technology with their students" (Rosenfeld & Martinez-Pons, 2005, p. 145). McCoy's (2010) study found that although younger respondents held high levels of self-efficacy, differences in self-efficacy scores between

various age groups may be explained by the amount of experience with different types of technology. To counter poor technological self-efficacy in pre-service teachers, Gülseçen and Kubat (2006) suggested that teacher education facilities should provide environments that develop understanding of the benefits of using technology in their teaching throughout initial teacher education courses. Further to this, Albion (1999) warned that inadequate professional learning for teachers was likely to impede their technological self-efficacy, and thus, reduce the application of technology as a teaching tool.

2.9.5 Attitude towards Computer Use

Attitude is one of the most widely studied psychological constructs (Petty, 2004), and has long been recognised as a predictor of behaviour in social psychology literature (Fishbein & Ajzen, 1975). An attitude is "a learned predisposition or tendency on the part of an individual to respond positively or negatively to some object, situation, concept, or another person" (Aiken, 1970, p. 551). In line with the work of Fishbein and Ajzen (1975), it is acknowledged that a person's attitude is considered to be a separate entity from their beliefs, which are considered to be theoretical ideologies or assumptions. Attitudes are a means for people to cope with the complex mass of information in the environment, enabling the protection of self-esteem, whilst maximising a positive experience and demonstrating personal values (Triandis, 1971). Triandis (1971) identified affective (positive or negative emotional feelings), cognitive (mentally linking subjects to categorised responses), and behavioural intentions (which predispose a person to a particular course of action), as the three fundamental components of attitude. Other research has identified a reciprocal influence between attitude and achievement, whereby a positive or negative attitude or achievement impacts directly on the respective opposite (Aiken, 1970).

Research has shown that a teacher's attitude towards technology can have a significant effect on how they use the technology in their teaching role (Glover & Miller, 2001; Grainger & Tolhurst, 2005; Kutluca, 2010). A negative attitude may result in apprehensive behaviour and poor confidence levels, leading to traditional teaching methods rather than the integration of technology in meaningful ways (Grainger & Tolhurst, 2005). A positive attitude is vital for using an IWB most effectively (Glover & Miller, 2001; Way et al., 2009). The findings of Kutluca's (2010) study showed that attitude to technology was affected by numerous variables, including computer anxiety and liking, computer experience and technological

knowledge, and computer self-efficacy, and the various interactions between these. In addition, technological self-efficacy has been found to have a positive impact on computer anxiety (Compeau & Higgins, 1995). Way et al. (2009) suggested that a positive attitude towards using IWBs is vital for capitalising on a teacher's creativity. Furthermore, a person's attitude towards computer use is also thought to be indicative of the attitude likely to be associated with future uses of technology (Roussos, 2007).

2.9.6 Facilitating Conditions

According to Venkatesh, Morris, Davis and Davis (2003), facilitating conditions are "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (p. 453). This definition draws upon the research of Thompson et al. (1991), who also noted that users who receive appropriate education, and who know that assistance is readily available when difficulties occur, are more likely to use the technology. This view is consistent with that of Robey (1979), as well as that of Teo (2009), who both identified a direct link between the level of support perceived and the utilisation of the particular technology. Favourable facilitating conditions have been found to impact in a positive manner on the application of technology, and particularly on a user's perceived usefulness, ease of use, and attitude (Ngai, Poon & Chan, 2007). Applied to the context of teachers using IWBs, facilitating conditions refers to ease of access (Section 2.9.6.1), technical support structures (Section 2.9.6.2), managerial support (Section 2.9.6.3), professional learning (Section 2.9.6.4), and the approach to professional learning (Section 2.9.6.5).

2.9.6.1 Ease of Access

Ease of access to technology has been identified as an area of concern for teachers (Grainger & Tolhurst, 2005; Slaouti & Barton, 2007). The location of IWBs has a significant impact on how they are used by teachers (Campbell & Kent, 2010). Teachers becoming more competent and regular users of the IWBs is more likely to occur if they have daily, unrestricted access (Armstrong et al., 2005; Cuthell, 2003). Furthermore, teachers have indicated a strong preference for having an IWB in their classroom as opposed to being located in a computer suite, for example (Cuthell, 2003), that requires advanced bookings, or is "hidden away" (Slaouti & Barton, 2007, p. 416) somewhere around the school. When booking an IWB in advance is required, spontaneity and lesson flow may be lost, and

teachers need to decide which lessons to allocate to teaching with an IWB, and which lessons not (Glover & Miller, 2002a). Setting up equipment has also been found to detract from ease of access (Glover & Miller, 2002a). Thompson et al. (1991) suggested that, in addition to ensuring such ease of access, benefits are likely to be gained from other avenues such as software upgrades, or enabling access to software via computers provided for home use. Peripheral items such as slates, scanners, microphones and video devices also need to be readily available to take advantage of planned and incidental learning opportunities (Bennett & Lockyer, 2008). Consideration also needs to be given to ensuring the arrangement of learning spaces is conducive for using IWBs, particularly with regard to visibility, sound, and lighting issues (Glover et al., 2005).

2.9.6.2 Technical Support Structures

Appropriate technical support structures are needed to establish and sustain the integration of IWBs into schools, and are one of the most crucial factors in ensuring technology acceptance (Teo, 2009; Teo & Noyes, 2011). Technical support is a key issue that influences teachers' use of technology (Campbell & Kent, 2010; Cheng, Wang, Moormann, Olaniran & Chen, 2012; Groves & Zemel, 2000), with English research suggesting that the support teachers experience ranges from excellent to elusive (Slaouti & Barton, 2007). Network connections must be dependable (Campbell & Kent, 2010), for research has found that there was teacher resistance to taking IWB courses because the technology and networks facilities were so poor in the school that the skills would never be used and thus it was deemed useless (Slaouti & Barton, 2007). Hence, technical support must be prompt, efficient and helpful, and networks must be reliable.

2.9.6.3 Managerial Support

Managerial support is another element vital for enhancing teachers' acceptance of technology (Campbell & Kent, 2010; Cheng et al., 2012; Groves & Zemel, 2000); it can also exert a positive influence on teachers' self-efficacy (Compeau & Higgins, 1995). Managerial support applies at various levels in an educational context (Cheng et al., 2012). With regard to IWB implementation, there may be support at governmental level, such as the immense support received by UK schools (Armstrong et al., 2005; Beauchamp, 2004). In Australia, the government has spent money on installing technology such as computers and laptops into schools (Schiller, 2003); however the spread of IWBs has been driven primarily by school

initiatives (Zevenbergen & Lerman, 2008). Within schools, strong leadership teams, with the support of school principals, are vital for implementing change and developing a culture that encourages the integration of technology (Grainger & Tolhurst, 2005; Schiller, 2003). These teams do not necessarily have to use the technology particularly well themselves, but must enthusiastically provide supportive discourse (Schiller, 2003). Verbal encouragement, such as this, has the potential to exert a positive influence on a person's self-efficacy (Bandura, 1986; Compeau & Higgins, 1995). Teachers benefit from the provision of time for education and experimenting with new technologies (Cheng et al., 2012; Teo & Noyes, 2011). Instances of managerial support are described in Slaouti and Barton (2007), whereby department heads and coordinators ensured that staff members were aware of resources available for use, and that professional learning opportunities were offered. However, Bill (2003) warned that in organisations that introduce technology innovations purely in a positive light, without addressing potential negative issues, users may reject the innovation due to uncertainty regarding coping strategies. This situation may be alleviated through incremental implementation accompanied by risk free familiarisation time (Bill, 2003).

2.9.6.4 Professional Learning

Most teachers require ongoing professional learning to fully develop their ability to integrate IWBs into their teaching practice (Armstrong et al., 2005). From Goodwin's (2011) continuum (Chapter 2, Section 2.5), it is evident that there are two interconnected main forms of professional learning that would assist teachers to make the transition through the five competency levels. The first form is focused on developing technical competence, which is the ability to effectively use an IWB operating system, peripheral hardware, external software applications and the internet, along with basic troubleshooting skills. The second form is focused on transforming a didactic traditional teaching style to an interactive, student-centred teaching approach. This approach to education in IWB use aligns with the principles of Mishra and Koehler's (2011) Technological Pedagogical Content Knowledge (TPACK) framework which underpins the Australian Teaching Teachers for the Future (TTF) project (Commonwealth of Australia (CoA), 2011). The TPACK framework advocates that expert teachers are those "who can bring together knowledge of subject matter, what is good for learning, and technology" (CoA, 2011, p. 1). It is little surprise that ongoing professional learning is required, because integrating technology provides both challenges and opportunities that are dynamic by nature (Beauchamp, 2004; Benton Foundation, 1997;

Charalambous & Karagiorgi, 2002; Mayo, Kajs & Tanguma, 2005; Rosenfeld & Martinez-Pons, 2005). When professional learning is either not successful, or unavailable, a teacher's IWB teaching skills tend to be restricted; it typically takes them longer to prepare a lesson using an IWB, and the lessons are generally presented in a static manner, affording minimal opportunities for student interaction with the IWB (Greiffenhagen, 2000; McCormick & Scrimshaw, 2001). Cogill (2008) suggested that teachers need time to experiment with an IWB before being expected to apply it effectively. Although a lack of education has been identified as having a negative impact on IWB implementation (Smith et al., 2005), research has shown that there are many benefits to be gained from time given to unpressured exploration of technology (Harris, 2002). Moreover, a trial and error approach should be valued, with mistakes viewed as stepping stones in the learning journey (Gillen et al., 2007).

Professional learning provides the foundation critical to the pedagogical change required to support the introduction of new technology (Glover & Miller, 2002b). The value of professional learning in this regard should not be underestimated, for IWBs are not a panacea for transforming pedagogy: "For it to work well for students and schools, we must build "human infrastructure" at the same pace we are installing computers and wiring" (Benton Foundation, 1997, p. 2). Developing an interactive approach is particularly vital for teachers who have little regard for IWBs, and who do not appreciate the value of the technology, nor the pedagogical transformation required to capitalise on its potential (Glover & Miller, 2001). Glover and Miller (2002b) emphasised that it is vital for teachers to commit time and effort to this change process for it to be most effective, but also stressed that some teachers, particularly those with greater experience, may need considerable convincing of the value before this will happen. Part of the reason teachers are reluctant to invest in this type of change could be because they perceive the pedagogical change to be driven by the installation of the technology, not by educational value (Cuban, 1986). Regardless of the circumstance, there is consistent evidence that professional learning is vital for developing effective teaching skills when using IWBs (Kennewell, 2005).

2.9.6.5 Approach to Professional Learning

Further to the case of professional development, Kennewell (2005) warns that the right approach is important to ensure that the most benefit is gained from this costly investment. Such an approach should involve teachers learning together, drawing on the use of internal

and external mentors, and maintaining a focus on both pedagogical and technical development (Kennewell, 2005). Campbell and Kent (2010) posited that "the delivery of professional learning needs to be shifted from teachers as receivers of knowledge developed by others" (p. 456), to teachers being involved in the development of knowledge. Pedagogical development is achieved through an extended process of dialogue and reflection undertaken by a team of teachers working in collaboration (Gore, Griffiths & Ladwig, 2004; McRae, Ainsworth, Groves, Rowland & Zbar, 2000; Polly, 2011). Extending on this approach, research suggests that teachers would also benefit from opportunities to observe how their colleagues use IWBs and to share their ideas (Grainger & Tolhurst, 2005; Sweeney, 2008). As with all technology, IWB software and hardware is changing at such a fast pace, that it is virtually impossible to keep abreast of the rapidly changing skill set needed to fully utilise this technology. With this in mind, Campbell and Kent (2010) suggested that the focus of professional learning should foremost be on "developing an understanding of teaching strategies that focus on the pedagogical skills that are associated with IWBs in education" (p. 456). If teachers have poor teaching methods, then "no amount of professional development in using IWBs will help" (Betcher & Lee, 2009, p. 21).

It is likely that pressure will increase on both current and future teachers to develop their ability to use IWBs, particularly as this technology has become increasingly widespread (Beauchamp, 2004). However, there is no quick fix solution to up-skilling teachers. Research has found that it takes between 18 months and 2 years for teachers to become competent, and that the amount of education received impacts directly on the level of competency achieved (BECTA, 2007). BECTA's research also suggested that teacher assistants should have IWB professional learning, as they are often required to help students use it. On a slightly different note, Beauchamp's (2004) study of a school staff that took part in a substantial professional learning course at the same time, also reported varying levels of competency amongst the teachers, possibly due to differences in pre-existing competencies, confidence levels, and pedagogical beliefs. Regardless of the approach to professional learning, there is no doubt that it is a key factor in improving teachers' ability to use IWBs, for as Betcher and Lee (2009) stated, "it is not about the hardware" (p. 13).

2.9.7 Subjective Norm

Subjective norm is the term given to a person's perception of how much effort should be applied and is influenced by the opinion of people that matter to them (Ajzen, 1991). It is one of the additions in theTAM2 model (Venkatesh & Davis, 2000), and stems from Fishbein and Ajzen's (1975) theory of reasoned action. Although studies examining the influence of subjective norm on technology acceptance have produced mixed results (Park, 2009; Venkatesh & Davis, 2000), there is research to suggest that this type of social information has the potential to influence an individual's attitudes to a new technology (Bandura, 1986; Bill, 2003). Teo (2011), for example, found that subjective norm had a significant influence on perceived usefulness of technology, an indirect influence on attitude, but virtually no impact on teachers' intention to use technology. Subjective norm has been found to be particularly influential on the uptake of the technology when it is a mandatory requirement (Venkathesh & Davis, 2000). In summation, social pressure, such as the expectations of management, supervisors, or colleagues, has the potential to be an extrinsic motivational influence on a person's expectations, behaviour, and motivation, as it enhances the valence, or the importance, of a task, and thus should be considered when integrating new technologies (Cheng, et al., 2012). Hence, it is reasonable to hypothesise that within an educational context, the effective implementation of IWBs would be best supported by a proactive and encouraging leadership team and a peer group who is receptive to technological innovations.

2.10 IWBs in Pre-Service Teacher Education

Few would argue against the premise that teacher education courses should provide pre-service teachers with "the tools and experiences that will be useful for the regular activities in their future jobs" (Teo, 2008, p. 414). With Australian primary schools increasingly "purchasing interactive whiteboards with the view to transforming teaching and learning" (Sweeney, 2008, p.1), it is reasonable to expect this teaching tool be included in teacher education courses. Indeed, an Australian study into IWB use raised concerns for practicing teachers who had received minimal education in IWB use at university, and highlighting the need for "providing opportunities for pre-service teachers to interact with and learn to critique the [IWB] resources being used in schools" (Maher, Phelps, Urane & Lee, 2012, p. 154). There are success stories regarding university faculties embracing IWBs (Friel et al., 2009), but it is more common to find research claiming that university programs are

unsuccessful in providing opportunities for future teachers to learn how to use technology effectively in a classroom (Baylor & Ritchie, 2002). Campbell and Kent (2010) documented two different approaches to IWB education for pre-service teachers that were implemented in 2008 at two Australian universities, La Trobe University and the University of Canberra, and which resulted in differing levels of success. Koehler and Mishra's (2009) TPACK framework emphasised the need for pre-service teachers to develop technological skills, as well as the pedagogical understanding to enable them to make informed choices in integrating technology into their teaching. It is accepted that universities should not be expected to 'train' teachers in the use of every new technological fad. However, IWB technology is continuing to evolve, with numbers increasing in classrooms worldwide and have been doing so for over 20 years (Futuresource Consulting, 2014) (Chapter 2, Section 2.3).

2.10.1 IWB Implementation at La Trobe University

Pre-service teachers were introduced to practical IWB skills in an ICT course at La Trobe University (Campbell & Kent, 2010). Two lectures were provided; the first explored the theory and pedagogy of classroom IWB use, and the second focused on accessing the IWBs at the university and associated software applications. A practical workshop enabled pre-service teachers to familiarise themselves with the software, and additional useful resources were provided. Furthermore, pre-service teachers were asked to take notice of how IWBs were used during their professional experiences; resulting reports of effective IWB use were scarce. Pre-service teachers were then asked to integrate their IWB skills into a mathematics course. Although they could verbalise the benefits of IWBs for exploring mathematical equations, there was "little to no transfer of the technological knowledge gained in the first semester's ICT course" (p. 455), rendering this approach less than effective. Campbell and Kent (2010) suggested that the poor use of IWBs observed by pre-service teachers during professional experience had possibly set "a pattern for these pre-service teachers to not use them well" (p. 456).

2.10.2 IWB Implementation at the University of Canberra

IWB implementation into teacher education courses at the University of Canberra used predominately hands on strategies and collaborative discussion that focused "on developing

an understanding of teaching strategies that focus[sed] on the pedagogical skills that are associated with IWBs in education" (Campbell & Kent, 2010, p. 456). The course was cyclical in design, as it provided opportunities for pre-service teachers to "develop opportunities and trial applications of IWBs, reflect upon the outcomes, and develop further the opportunities for the effective enhancement of teaching and learning through the use of IWBs" (Campbell & Kent, 2010, p. 457). The sixty pre-service teachers in the course then spent a day immersed in practical sessions with IWB 'Master Teachers' who engaged them in dialogue and hands on experience with lesson samples demonstrating cutting edge IWB use. This approach resulted in pre-service teachers gaining confidence with using IWBs and developed their understanding of IWB pedagogy.

2.10.3 A Different Approach

A different approach to providing IWB education for pre-service teachers was taken in a research project by Gregory (2010). Gregory started by identifying local teachers who were deemed to have developed the greatest proficiency with IWBs. These teachers were then video recorded using IWBs in lessons, with the footage used as a source of professional learning for pre-service teachers and education teaching staff at university. In this way, both practical skills and pedagogical approach were effectively developed.

2.10.4 The Challenge for Universities

The rise of IWBs in schools has presented a new challenge for universities (Beauchamp, 2004), and as research showed, Australian universities are starting to respond to this challenge (Campbell & Kent, 2010). There is a growing expectation that new teachers will be "well versed in providing an efficient, seamless integration of IWB technology into lessons across the curriculum" (Campbell & Kent, 2010, p. 451). This view was evident in the TTF (CoA, 2011) project, which aimed to enable final year pre-service teachers to become proficient at integrating technology into their classroom practice. The integration of IWB technology into classroom practice should be introduced early into a variety of units within teacher education courses as this will not only be immediately beneficial to pre-service teachers' learning, but will also have a flow on effect to their developing pedagogy (Campbell & Martin, 2010). Universities need to provide pre-service teachers with opportunities to develop their IWB skills, but the pace of change is slow (Campbell & Kent, 2010). There is evidence to suggest that this slow rate may be due to "fear of failure,

disinterest, or aversion to change" (Friel et al., 2009, p. 300). Regardless of these barriers, maximising the potential of this technology is a goal worth striving for. In Teo's (2008) words, "To do otherwise is to produce future teachers with underdeveloped skills in the use of technology" (p. 414).

2.10.5 Meeting the Needs of Pre-Service Teachers

With the extensive exposure to technology that most pre-service teachers have experienced throughout their lives, it would seem reasonable to expect them "to be technologically proficient" (McCoy, 2010, p. 1614). However, as Mayo et al. (2005) discovered, pre-service teachers' familiarity with every day technology is simply not enough, as "they need specific preparation to develop technology-integrated curricular lessons" (p. 3). Research has found that the quality and number of technological experiences that are included in teacher education courses is crucial to the rate and success of subsequent technology integration by teachers in their teaching practice (Agyei & Voogt, 2011; Drent & Meelissen, 2008). Furthermore, other research has found that the varying levels of mentoring, education and support the student teachers received in using IWBs, when combined with their technological self-efficacy and beliefs about the impact of technology on learning outcomes, linked strongly with their level of use while in the classroom environment on professional experiences (Hammon, Reynolds & Ingram, 2011). As such, Thong et al. (2002) advise universities to integrate numerous experiences using a variety of technologies in order to gain confidence and experience that will transfer to future technological applications. Training in the use of specific technologies is inadequate. Rather, the provision of education is needed to enable pre-service teachers to develop the skills and disposition to select and apply appropriate technologies for their subject matter, as well as the pedagogical understanding needed to make integration meaningful and beneficial to student learning (Wetzel, Buss, Foulger & Lindsey, 2014).

Hammon et al. (2011) found that using an IWB was a feature of most pre-service teachers' professional school experiences. The pre-service teachers integrated IWBs into lessons to varying degrees, from routine use as a whole class teaching tool, to extended use, where students interacted with the IWB, and to innovative use, whereby the technology was integrated in a range of more complex contexts. Other researchers have expressed concern for pre-service teachers who returned from practical school experiences and reported seeing

IWBs used in a very basic manner, because these types of experiences may instigate a cycle of poor use (Campbell & Kent, 2010). It is vital that teacher education courses and schools where that provide practical field placements recognise the need for pre-service teachers to become conversant not only with practical IWBs skills, but also the pedagogy for supporting their use (Campbell & Kent, 2010; Maher et al., 2012; Mishra & Koehler, 2011). The partnership between universities and schools is vital because it is important that pre-service teachers experience authentic classroom practice, including the use of modern technologies (Kruger, Davies, Eckersley, Newell & Cherednichenko, 2009).

IWBs may be a catalyst for educational change, but the real challenge for pre-service teachers is to develop understanding of the pedagogy and associated issues required to capitalise on the potential of this technology (Betcher & Lee, 2009; Maher et al., 2012; Mishra & Koehler, 2011). A UK report by the JISC (2009) succinctly stated, "Rather than replacing the teacher, technology has in many ways increased the focus on pedagogic skills. The art of the practitioner as instigator, designer and animateur remains key to the process of learning" (p. 5). Although it is important for universities and pre-service teachers to embrace IWB technology, the process is not a simple one (Campbell & Kent, 2010). Studies such as this raise awareness of the potential of this technology amongst pre-service teachers, university teaching staff, and in-service teachers. Teo and Noyes (2011) suggested that pre-service teachers need to experience a balance between IWB activities that are both practical and enjoyably hedonic. Campbell and Kent (2010) suggested that such a program may benefit from developing a two-way learning relationship with in-service teachers. However, more research is needed to investigate successful models of IWB integration at universities, at both staff and pre-service teacher levels.

2.11 Australian Research in Relation to IWB Use in Primary Schools

In order to gain a broader understanding of IWB use in Australian primary schools, three studies related to this topic were examined. An overview of these studies is provided in the following sections: Study 1 (Section 2.11.1), Study 2 (Section 2.11.2), and Study 3 (Section 2.11.3).

2.11.1 Study 1: Maher et al. (2012)

Maher et al.'s (2012) research focused on 116 teachers' use of digital IWB resources across 13 New South Wales primary schools. These teachers' initial confidence levels varied from

quite to very confident, with 82% of teachers having IWBs permanently in their classroom and 15% having IWB access for at least part of the day.

Some of the schools in this study had developed a culture whereby teachers were expected to share how they were using IWB resources on a regular basis; the teachers in these schools were more successful in creating support networks and had further developed their IWB skills than had teachers from the schools that had not established such a culture. The teachers who engaged in this type of IWB education were more inclined to spend time developing their skills and were more efficient in creating their own resources. They were also more likely to use resources recommended by other teachers and had a greater awareness and understanding of resources that other teachers were using. It was reported that these teachers used IWBs in a variety of different ways, including small group work, group rotation sessions, whole class teaching, and self-directed learning experiences.

The greatest benefits for teachers stemmed from sharing sessions that included discussion about pedagogical strategies, particularly a student-centred approach, in conjunction with the sharing of IWB resources. Teachers in schools that had not developed this type of culture were less willing to develop, modify or share IWB resources than the teachers in the schools that had. A lack of education in IWB use was acknowledged to be problematic in some schools; indeed, some staff had avoided engaging in IWB professional learning sessions, which then had negative repercussions on their ability to use an IWB effectively.

Leadership was found to be an influential factor in creating this culture, particularly through the organisation of ongoing internal professional learning opportunities. The provision of time for teachers to explore available resources was recognised as necessary in supporting the development of teachers' understanding and awareness of IWB resources.

Perceived ease of use of IWB resources and accessibility were the two most common factors found to influence these teachers' resource choices. Linking IWB software to external documents, websites, and multimedia objects was common practice for the majority of these teachers, as was writing on the IWB. However, the handwriting recognition and recording functions were reportedly seldom used. Similarly, very few teachers used peripheral items, such as scanners, visualisers, slates or digital microscopes, in their teaching.

2.11.2 Study 2: Sweeney (2008)

Sweeney's (2008) research focused on changes to the pedagogy of eight teachers in a primary school in South Australia over time due to the impact of IWBs in their classrooms. For four of the teachers, having an IWB in their classroom was a new experience, whereas IWBs had been in the other four teachers' classrooms for approximately 12 months.

This study found that education in IWB use was an important asset in helping teachers transition through the developmental stages of the framework, particularly so in the latter, more complex stages that required advanced pedagogical understanding and technical skill. Consistent access to an IWB was found to be crucial to the development of skills in this area; the provision of laptops with the IWB software that teachers were using was found to be particularly beneficial. Confidence with technology was also noted as a requirement to develop into the more advanced stages of the framework.

The developmental framework that resulted from this research was viewed as very helpful by the participants in the study as it enabled the teachers to clearly and easily identify how they could improve their IWB use. As the framework described both technical and pedagogical IWB skills at each stage of development, it provided a valuable stimulus for professional dialogue and thus acted as a catalyst for teacher learning.

Supportive leadership was a vital factor in the creation of a school culture that supports the development of teachers' IWB skills. Effective IWB use depends upon ongoing support that nurtures the enthusiasm of teachers who are "willing to develop and use the technology and become mutually interdependent in the development of materials" (Sweeney, 2008, p. 1).

2.11.3 Study 3: Bennet and Lockyer (2008)

Bennet and Lockyer's (2008) study focused on the IWB use and perspectives of four teachers in the Australian Capital Territory who volunteered to integrate IWB technology into their primary school classrooms. IWBs were installed into these teachers' classrooms at the commencement of the study. These teachers all perceived themselves to be reasonably confident with technology. Of these, two were highly skilled with computers, one felt his/her computer skills had reached an average level due to the steep learning curve experienced as a teacher, and the other felt reasonably competent except when trying to solving technical

issues. The most confident teacher used the IWB the most, while the least confident teacher used the IWB the least.

The introduction of an IWB did not change the teachers' pedagogy; rather, the teachers integrated the IWB into their usual routines. As such, the teachers controlled the IWBs for the most part by using a whole class teaching approach for presentation or demonstration purposes. English and mathematics were by far the most common subject areas taught using an IWB. Peripheral items, such as scanners or videos, were rarely used; limited availability of such resources was noted in the study. Teachers saved work on the IWB to revisit at a later date. Few technical issues occurred, causing very little disruption to lessons.

The participants welcomed IWB technology into their classrooms and identified many benefits associated with its introduction. The IWB enabled greater efficiency for the teachers with regard to planning and preparing lessons, increased accessibility to online resources, enhanced student engagement, lessons could be recorded and ongoing work saved for later revisitation. To advance these teachers' use of IWBs, pedagogical development was recommended.

2.11.4 Summary

From Studies 1, 2 and 3 (Sections 2.11.1, 2.11.2 & 2.11.3 respectively), it was evident that leadership and the development of a supportive, sharing culture were key elements vital for successful IWB implementation. Ease of access was important in all three studies, as was professional learning, which contributed to the development of teacher confidence levels and IWB skills. In all three cases, a lack of peripheral items was noted.

2.12 Concluding Note

This chapter has provided a review of the literature pertaining to the issues surrounding the preparation of pre-service teachers to integrate IWBs into their teaching practice. The complex partnership between technological proficiency and pedagogical development was also highlighted. In association with this, the five stages of teachers' IWB use according to Goodwin's (2011) framework were examined. The accumulated research emphasised the need for a student-centred interactive teaching style, in conjunction with the gradual development of technological skills, to maximise the potential of this medium.

Factors influencing a teacher's progression in learning to use an IWB effectively were also examined; these being, ease of access and supporting structures. With regard to the latter, managerial support, technical support, and education in IWB use were identified as key influences. After delving into the theoretical background underpinning recognised technology acceptance models, six of the major contributing variables (perceived usefulness, perceived ease of use, perceptions of technological complexity, technological self-efficacy, attitude towards computer use, and facilitating conditions), were then subjected to close scrutiny as was the notion of subjective norm.

Limited literature was available regarding IWB use at university level. That which was available, acknowledged the need for change as it revealed a need for ongoing education with, and better access to, IWBs for both teaching staff and pre-service teachers. Although IWBs have been recognised as a 21st century teaching tool, it was evident that IWBs had barely begun to make an impact on teaching and learning at universities. IWBs were found to be a part of most pre-service teachers' school practicum experiences; however the support or awareness of this technology in teacher education courses was patchy at best.

A broader understanding of IWB use in Australian primary schools was gathered from a review of three studies. Supportive leadership, school culture, expectations for use, and associated resources were found to be important factors. Likewise, teacher confidence, accessibility, perceived ease of use of the technology, ongoing professional learning, and pedagogical development were identified as influential in the effective use of IWBs.

The following chapter presents the research methodology used in this study, and is informed by the key findings of this literature review.

Chapter 3

RESEARCH METHODOLOGY

> *The frame into which we wish to make everything fit is one of our own construction; but we do not construct it at random, we construct it by measurement so to speak; and that is why we can fit the facts into it without altering their essential qualities.*
>
> *(Poincaré, 1952, p. xxv)*

3.1 Introduction

The research methodology underpinning this study is described in this chapter, and justifications for the decisions made throughout are provided. A pragmatic approach has been taken in designing this research instrument because "it is not committed to any one system of philosophy and reality … [enabling the researcher to] draw liberally from both quantitative and qualitative assumptions" (Creswell, 2014, p. 11). The research approach emerged from a search of relevant literature (Section 3.2). Details are provided regarding the research approach and reasons for these choices, including insight into the qualitative and quantitative research methods used (Section 3.3). All ethical considerations were addressed in accordance with the requirements of UTAS and the Human Research Ethics Committee, as described in Section 3.4. The sampling methods used for participant selection for the three surveys and subsequent interviews are described in Section 3.5. The research instruments are introduced and followed by an in-depth discussion of the surveys and semistructured interviews (Section 3.6). Details of the pilot studies are then given (Section 3.7). The Stage 1 distribution of online surveys is explained in Section 3.8, and is followed by the method used to conduct the semistructured interviews (Section 3.9). A detailed account of the analysis of both quantitative and qualitative data is given in Section 3.10, with issues regarding validity and reliability of the study discussed in Section 3.11. The chapter concludes with a brief summary (Section 3.12).

3.2 Theoretical Foundations

An extensive examination of the literature pertaining to this study and reviewed in detail in Chapter 2, highlighted the importance of teachers developing both a suitable pedagogy, and the technological skills needed to use an IWB. This holistic approach is considered to be the most conducive for effective IWB use (Betcher & Lee, 2009), and is evident in Goodwin's (2011) teachers' developmental stages of IWB use. Fishbein and Ajzen's (1975) theory of reasoned action underpinned Davis' (1985) technology acceptance model and provided a

theoretical basis for understanding factors that may influence acceptance of technology. Teo's (2009) work drew on these theoretical foundations, as well as Bandura's (1986) social cognitive theory. Teo (2011) later included the notion of 'subjective norm' (see Chapter 2, Section 2.9.7), which refers to a person's perception of how he/she should behave because of the expectations of others (Fishbein & Ajzen, 1975), in his model for explaining teachers' intention to use technology. Further examination of this literature provided access to methods and survey techniques previously used by researchers in this field, and enabled the identification of the seven complex and interacting variables that were examined in this study.

The available literature directly related to IWB use at universities in Australia was quite limited, but evidence was found indicating that the impact of this technology on pre-service teacher education courses, for both teaching staff and pre-service teachers, was minimal (Campbell & Kent, 2010). It was also evident that change was needed in the form of ongoing education for teacher educators and improved access to the technology, if IWBs are to be used as a teaching tool in teacher education programs at this level.

The research literature thus contributed to the design of the methodology used in this study and assisted in shaping the survey and interview questions. Further details regarding the survey and interview are presented in Sections 3.6.1 and 3.6.2 respectively.

3.3 Research Approach

A mixed model research approach using both quantitative and qualitative methods was chosen because it constituted the most appropriate data collecting technique to be applied according to the research questions, and enabled deeper understanding to be gained of the research problem (Gay, Mills & Airasian, 2009). Although he acknowledged that many may still view the combining of these two completely distinct research approaches as a contentious issue, Bryman (2006) suggested that a combined approach was emerging "as an important component of the social researcher's toolkit" (p. xxv). This aligned with the view of Salkind (2012), who stated: "No one model or research method is the perfect fit for answering a question" (p. 8). Indeed, research questions may be better answered when more than one research method is used, as long as the method selected is driven by the research questions and not vice versa (Salkind, 2012). Some believe that attempts to aggregate data may result in scrappy research through under-analysis (Silverman, 2004); however other

researchers (e.g. Neuman, 2004) have recognised that qualitative and quantitative research methods "can work together to broaden educational research from a single to a multiple perspective" (Gay et al., 2009, p. 466). A multi-instrument approach, such as the one taken in this study, provides the triangulation needed to improve the internal validity of the study (Gay et al., 2009).

Quantitative research was used because it enabled the researcher to collect and analyse relative numerical data, with a view to order, describe and explain a situation (Gay et al., 2009). For example, survey research, such as was used in this study, is a means of collecting numerical data that reports on the current state of things (Gay et al., 2009), and provides raw data that can be analysed for information pertaining to potentially influential factors and underlying trends. There are many advantages associated with survey research (Burns, 2000; Zikmund, Babin, Carr & Griffin, 2010). Online surveys were employed in this study because they saved time in posting hard-copies between the participants and the researcher. They also offered the respondents flexibility in relation to where and when they completed the surveys. Furthermore, they were inexpensive for the researcher, and provided greater anonymity than face-to-face methods. In addition, all participants were presented with exactly the same questions in exactly the same way, thus reducing the number of variables, and the software provided an efficient and timely means of exporting the data gathered directly to Excel ready for coding and analysis.

Careful consideration was given to the disadvantages associated with this type of survey research. For example, Zikmund et al. (2010) pointed out that participant misinterpretation of questions may be an issue, as well as problematic low response rates, refusal to participate, administration errors, or flawed questions. In addition, unanticipated opportunities to gather supplementary information may be lost due to closed questioning or questions that could have been included but were not thought of in time (Burns, 2000; Wiersma, 1995). Because the survey was distributed electronically, potential participants with an aversion to using technology may not have seen the invitation, chosen to ignore it, or simply have been uninterested in the technology-based topic and hence not participated. Some participants may not have applied themselves fully and merely selected random answers, a possibility raised by Kumar (2011) in relation to survey research.

Several measures were put into place to overcome the aforementioned disadvantages. A pilot study (Section 3.7) was used as a "dress rehearsal" (Jaeger, 1997, p. 469), ensuring questions

were unambiguous, relevant, not misleading, and were free of construction issues or other flaws that may render the data unusable or disappointing (Burns, 2000; Weirsma, 1995; Zikmund et al., 2010). The survey questions were constructed with care and clarity to ensure consistency of interpretation for all participants (Gay et al., 2009). Some parts of the survey utilised a five point Likert scale statement response system, which is a recognised format for attitudinal measures in educational research (Gay et al., 2009). This approach helped to gain a better understanding of the participants' perceptions, because each participant rated his/her level of agreement to a number of statements, which were subsequently analysed. Historically, information gathered through Likert-type scales has been viewed as nonparametric ordinal data, as the data are ranked according to set criteria according to an individual's preferences (Jackson, 2006; Nunnally, 1975a). In expressing scepticism regarding the validity of unequivocal categorising of data, Lord (1953) satirically pointed out that numbers do not know where they came from. By this, he is warning that researchers must be careful to retain accuracy by ensuring the data are not misrepresented (Velleman & Wilkinson, 1993); hence two Likert statements phrased in different ways were used to investigate each aspect of the seven potentially influential variables (see Table 3.6-1) identified in the Literature Review (Chapter 2, Section 2.9) (Bandura, 1986; Teo, 2009). Recent research also recognised that the nature of these types of scales lends itself to ambiguity, as the scale provides a parametric indication of difference through a continuous scale, thus making it possible for it to be treated as interval data (Tabachnick & Fidell, 2007). However, Zikmund et al. (2010) warn that such scales must be comprised of at least five intervals for the information to be treated as interval data, which is reflected in the 5 point Likert scale that was used in this study.

Qualitative research can be instrumental in illuminating underlying causes and effects, perceptions, beliefs and attitudes and other subtleties through careful sifting of gathered data (Burns, 1994; Kumar, 2011). Barton and Lazarsfeld (1969) concurred, saying: "Like the nets of deep-sea explorers, qualitative studies may pull up unexpected and striking things for us to gaze on" (p. 165). However, Burns (1994) noted that qualitative data, and specifically interview data, may be subject to a degree of subjective opinion on the part of the interviewer and interviewee. Nevertheless, semistructured interviews are one of the principal qualitative tools available to researchers (Burns, 1994). The interview schedule acts as a guide, but remains flexible enough to permit further questioning regarding crucial or unanticipated issues if the opportunity arises (Burns, 1994). Furthermore, participants are able to contribute

additional information that they believe is relevant even though a relevant question might not have been asked. For these reasons interviews were used in the current study.

3.4 Ethical Issues

The ethical considerations for this research "address moral concerns and standards of professional conduct in research that are under the researcher's control" (Neuman, 2004, p. 62). Prior to commencement, authorisation for this research study to take place was sought from the Human Research Ethics Committee (Appendix A), with approval gained after slight revisions were made. The approval signified the appropriateness of the ethical considerations given to the research approach, including methods of participant recruitment. Approval was necessary to ensure the ethical treatment of the participants, as well as the correct handling of the data they would contribute. Furthermore, to enable the Tasmanian Department of Education (DoE) primary school teaching staff to take part if they so chose, approval for this research study was sought and gained from the DoE (Appendix B), as well as from the principal of the participating primary school. The secretarial staff of the Faculty of Education at UTAS emailed links to the relevant online surveys to the entire population of pre-service teachers and Faculty of Education teaching staff. The Administrative staff at the DoE primary school emailed the relevant survey link to all teaching staff in their school. Information Sheets (Appendix C) were attached to the survey emails. This method of survey distribution made it possible to maintain the privacy of participants, as per ethical guidelines, and also enabled participation details to be presented in a straightforward and motivating manner, which Wiersma (1995) considered essential to this type of research. Interview participants read and signed a Statement of Informed Consent (Appendix D) before commencing their interviews.

3.5 Participants

The participants in this study comprised three separate groups; pre-service teachers enrolled in the 4-year Bachelor of Education, primary teacher education course at the University of Tasmania (UTAS) in 2011/2012; Faculty of Education teaching staff at UTAS; and registered Tasmanian primary school teachers. The teaching staff and pre-service teachers at UTAS were selected for this study due to the researcher's past affiliations with UTAS, as well as the geographical proximity to the researcher as it is the only university in Tasmania, where the researcher resides. Although only UTAS was chosen for this study, research (Campbell & Kent, 2010, Chapter 2, Section 2.10) has shown that other Australian universities have been

endeavouring to include IWBs in their teacher education programs with varying degrees of success, hence it is hoped that this study may be beneficial to other teacher education courses around Australia.

The survey was conducted on a voluntary basis; hence participation was encouraged through a motivational invitation. This approach was effective in gaining a substantial number of pre-service teacher survey participants. Fewer UTAS Faculty of Education teaching staff responses were received than was hoped, however an adequate number was obtained after resending the invitation. The greatest difficulty proved to be gaining principal approval to invite participation from Tasmanian primary school teachers. Only one approval was received from the three principals that were initially approached, this being the principal from Sandbridge Primary School (pseudonym). After contacting an additional five principals, no further approvals for participation were received. In total, 145 pre-service teachers (128 who studied on-site at either of the Newnham, Sandy Bay, or Burnie Campus, and 17 who studied online), 18 UTAS Faculty of Education teaching staff, and 2 registered teachers at Sandbridge Primary School, chose to participate in this study.

Table 3.5-1 presents the demographics of the three groups taking part in this study with regard to gender and age group. In order to gain a deep understanding of the social phenomena underpinning this study, purposive nonprobability sampling techniques were employed as it was the number of potential responses received was unknown prior to the completion of the survey (Neuman, 2004). This method of data collection suited this study as all 21 participants who indicated they were willing to take part in the interview stage of this study were subsequently interviewed. In this way, data were gathered from the broadest range of participants with regard to participant group, age group, gender, and technology acceptance (as described by Teo, 2009, in Chapter 2 of this study, Sections 2.9.1-2.9.7). This approach is considered by Burns (2000) as appropriate for gaining insight and developing understanding about a given topic.

Table 3.5-1

Survey Participant Demographics According to Gender and Age Group

		Age Range						
Gender	Participant Group	18-25	26-30	31-40	41-50	51-60	61+	Total
Total	Pre-Service Tch	10	0	9	1	0	0	20
Male	UTAS Staff	0	1	0	1	3	0	5
n=25	Primary Sch Tch	0	0	0	0	0	0	0
	Total	10	1	9	2	3	0	25
Total	Pre-Service Tch	33	10	32	41	8	1	125
Female	UTAS Staff	0	1	3	4	4	1	13
n=140	Primary Sch Tch	0	0	0	1	1	0	2
	Total	33	11	35	46	13	2	140
Combined Male & Female		43	12	44	48	16	2	165

In each of the age group ranges, Table 3.5-1 shows that there was a higher number of female than male respondents. This was also the case across each of three participant groups. In addition, it can be seen that there were fairly similar numbers of participants from the 18-25, 31-40 and 41-50 year old age groups, a notably smaller percent in the 26-30 year olds, and a much smaller percent in the 61+ age group (Figure 3.5-1).

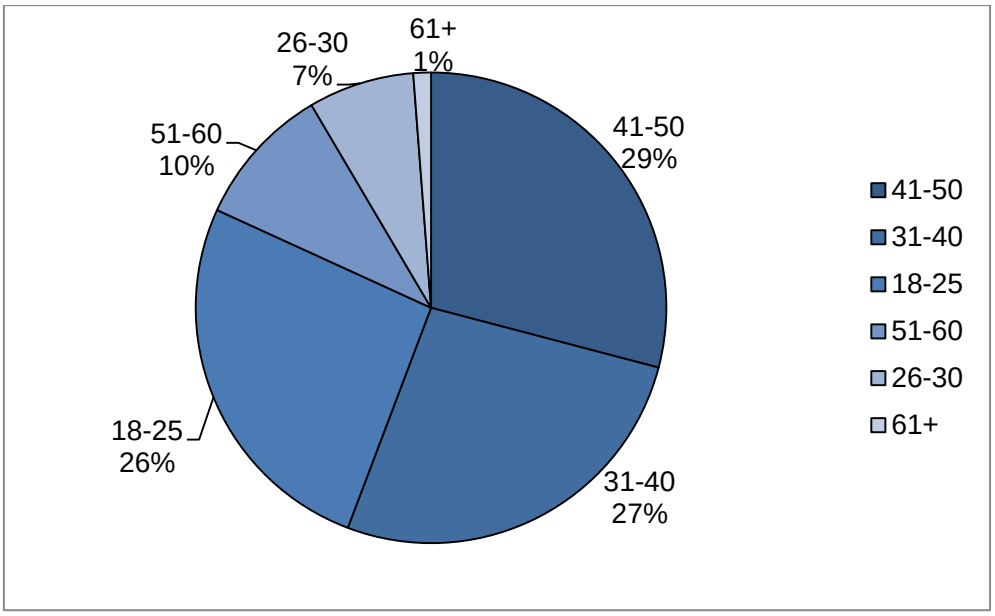

Figure 3.5-1. Percentage of Total Population of Respondents by Age Group.

Figure 3.5-2 shows that there was a fairly even distribution of pre-service teachers across year levels, with approximately one quarter coming from each of the four possible years of study.

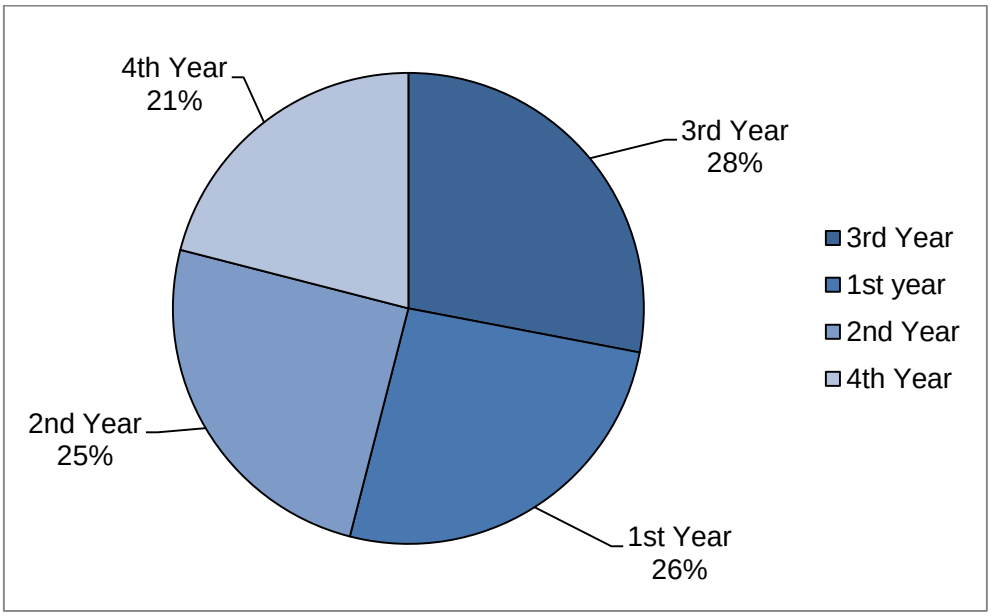

Figure 3.5-2. Pre-Service Teacher Participants' Year of Study.

3.6 Research Instruments

Surveys (in the form of questionnaires) and semistructured interview schedules were the research instruments chosen to gather data for this study. Kumar (2011) specifically notes the distinction between interview schedules as research instruments, and interviews as a method of data collection. According to Kumar (2011), the combination of quantitative and qualitative research is important "when ascertaining the nature and extent of diversity and variation in a phenomenon" (p. 105). Indeed, the use of multiple data sources enabled valuable cross comparison between the qualitative and quantitative data sets (Wiersma, 1995), and added strength to the validity of the data and the analysis of the findings (Burns, 2000). The combination of the two data collection methods was also manageable with the time available to access participants and reflected the researcher's data type preferences which Denscombe (2007) acknowledged as a legitimate consideration in relation to data collection. The instruments are discussed in turn in the following two subsections.

3.6.1 Surveys

The first two sections of the surveys (Appendices E-G) were used to gather relevant demographic data, as well as factors identified in Section 2.9 of Chapter 2 that may

potentially have impacted on their attitude to using IWBs (Campbell & Kent, 2010). These factors include information regarding participants' experiences with IWBs during their own education both as a student and as a pre-service teacher, as well as their prior experiences with technology (Campbell & Kent, 2010). For ease of collection and analysis, the demographic questions were presented in a closed format (Kumar, 2011). Other questions were designed to gather data relating to potentially influential factors identified in the Literature Review (Chapter 2, Section 2.9) (Bandura, 1986; Broady, Chan & Caputi, 2010; Compeau & Higgins, 1995; Glover et al., 2005; Grainger & Tolhurst, 2005; Paraskeva, et al., 2008; Prestridge, 2012; Teo, 2009; Thompson, et al., 1991). Although the surveys presented as many questions as possible in exactly the same format for all participant groups, for example, gender, age, and experience and education with IWB use, variation was needed to take into account other background information of the different groups. Teacher education course and progression, for example, were included only in the pre-service teacher survey, whereas university and type of employment were unique to the UTAS Faculty of Education teaching staff survey. Similarly, different options for type of employment were required for the primary school teacher survey. In each case these data defined groups between which there could be differences in relation to the variables of interest.

The third and final section of each of the three surveys comprised 56 five-point Likert scale items presented as eight statements relating to each of the seven variables thought to influence technology use, as uncovered by the Literature Review (Chapter 2, Section 2.9) (Bandura, 1986; Teo, 2009). The seven variables and two exemplar Likert statement items pertaining to each variable are presented in Table 3.6-1. The eight questions for each of the seven variables were presented as a mix of positively-keyed and negatively-keyed items. These items were based on the constructs and statements underpinning Teo's (2009) research instrument (see Appendix H), and adapted for use in this study. Minor adaptations were made in order to focus Teo's (2009) instrument that had a general technology focus, so that it had a direct IWB focus. For example, 'I could learn to use an IWB if someone showed me how to do if first' replaced Teo's (2009) statement, 'I could complete a job or task using the computer if someone showed me how to do it first'. Similarly, 'It takes too long to learn how to use an IWB' replaced Teo's (2009) statement, 'It takes too long to learn how to use the computer'. Because the adaptations were minor, the underlying variables were assumed to be the same as that of Teo's (2009) study. Teo (2009) conducted confirmatory factor analysis on his research instrument, with the model result indicating a good fit (see Appendix H).

Mixing the direction of the statements was used to eliminate possible response bias through a "tendency for respondents to answer most questions in the same way, such as simply checking 'disagree' for all questions" (Nardi, 2003, p. 70). To investigate the first variable, perceptions about the usefulness of IWBs, participants were asked to indicate their level of agreement to presented statements. For ease of interpretation and discussion, the negatively framed Likert statements from the survey were recorded in a positive manner in the Survey Results (Chapter 4, Section 4.5). Appendices E-G include a complete copy of the original Likert statements used in this study.

Table 3.6-1

Variables Investigated with Sample Likert Statements in Surveys

Variable Investigated	Sample Likert Statements
Variable 1: Perceptions about the usefulness of IWBs	An IWB is a useful teaching tool It is difficult to think of ways to use an IWB
Variable 2: Participants' attitude towards IWBs	I like using IWBs IWBs are an important teaching tool
Variable 3: IWB self-efficacy	I am confident I can use an IWB Using an IWB makes me nervous and uncomfortable
Variable 4: Perceived ease of use of IWBs	IWBs are easy to use IWBs are not worth the effort needed to use them
Variable 5: Perceptions regarding technological complexity of IWBs	IWBs are too complex to use Trouble-shooting IWB issues is difficult
Variable 6: Facilitating conditions for using IWBs	There is always an IWB available for me to use Support is readily available for using IWBs
Variable 7: Pedagogy	I will need to change my teaching pedagogy when using an IWB IWBs support mixed learning styles, e.g. visual, kinaesthetic

The statistical structure of Teo's (2011) research instrument is sound. The original convergent and discriminant validities assessed by Teo (2011) are included in Appendix H.

There were two main reasons why this section was presented using Likert type items. The first was that it was better suited to statistical analysis than open-ended items seeking the same information, and the second was that it was less complex to construct than the Thurstone or Guttman scales (Burns, 2000; Kumar, 2011). The final item on each survey provided an opportunity for participants to indicate their willingness to take part in the interview stage of this study, should they be selected to participate.

The survey was divided into sections that grouped like questions together. The optional progress bar included in the Qualtrics (Qualtrics, 2015) software package was utilised and displayed at the bottom of each page of the survey to encourage completion of the survey as participants could determine how far through they were. Text options were embedded at various points throughout the survey to enable participants to include additional information or clarify answers as need be. Participants wishing to provide information about IWBs being used in ways not listed in the options provided, is one such example; providing a written explanation of why they thought they would or would not be expected to use an IWB when they gain a teaching position is another. Each question/statement was coded for analysis according to which research question it investigated.

3.6.2 Semistructured Interviews

To gain a better understanding of the interview participants' points of view, the researcher conducted semistructured interviews with willing volunteers from each of the three participant groups. Semistructured interviews are considered to be an important tool for qualitative researchers (Burns, 2000), and made it possible in this case to probe deeper and "unfold the meaning of peoples' experiences, to uncover their lived world prior to scientific explanations" (Kvale, 1996, p. 1). Three semistructured interview schedules (Appendices I-K) were designed for Stage 2 of this study, with the intention of gathering information pertinent to the research questions. The researcher acted as the interviewer, and used the planned schedule as the backbone for the interview. However, the flexible nature of the research instrument enabled the researcher to diverge from the planned schedule should an unexpected issue arise during the course of an interview. This was important as following such issues could potentially elicit a more valid response and/or uncover information that would have otherwise remained unexplored (Burns, 1994; Kumar, 2011). It is acknowledged

that more skills are required of the interviewer in this type of approach than that of a structured interview (Kumar, 2011), and the pilot study served to enhance confidence, familiarity and skills of the researcher in this area. The wording and composition of the questions were also improved by the pilot study to ensure that information relevant to the research questions of the highest quality and depth was obtained. Nevertheless, if questions were not completely understood, the interviewer was able to repeat or rephrase in accordance with Kumar's (2011) suggestions.

Most of the questions used in the interviews were open-ended, thereby enabling "respondents to express themselves freely … [and] virtually eliminate the possibility of investigator bias" (Kumar, 2011, p. 163). Investigator bias, in this instance, refers to the bias caused by gathering data through questions only of the researcher's choosing or thought pattern which may inadvertently lead or restrict respondents in their answers (Kumar, 2011; Kvale, 1996). On occasion, closed questions were used, with the affirmative or negative response immediately followed up by an open-ended question designed to probe more deeply for the respondent's reasoning behind his/her answer. When an unexpected but related response was received, the researcher responded with a spontaneous question in order to delve further into the issue.

Disadvantages associated with the use of semistructured interviews include a high degree of difficulty in comparing and contrasting data, greater complexity of the data, and time commitment required when coding data for further analysis (Burns, 1994; Kumar, 2011), and increased time and expense required to conduct individual interviews (Kumar, 2011). The interviews were audio-recorded, which also caused increased time and expense as they then needed to be transcribed before further analysis could take place. Kumar (2011) also noted that interviewer bias was more likely to impact on open-ended questions through the personal interpretation of responses, and the framing of questions. To ensure the accuracy of the interview transcripts, they were emailed to the interviewees for verification or amendment. Of the 21 interviews that were conducted in total, five minor amendments were made, and one interviewee provided more information. After this, the interviews were coded according to the research questions and thoroughly examined for common themes related to patterns discovered between the quantitative data analysis and the literature review. Further details of the coding process are presented in Section 3.10.2.

3.7 Pilot Studies

Pilot studies were conducted prior to the commencement of Stage 1 (surveys) and Stage 2 (semistructured interviews) of this study with the intention of testing and learning about the research instruments as opposed to data collection (Burns, 1994). Whilst acknowledging the substantial time investment in this process, many consider pilot studies to be a critical step in fine-tuning research instruments (Gay et al., 2009; Zikmund, et al., 2010). Pilot studies provide controlled conditions in which problems associated with the research approach can be uncovered that may previously have not been obvious (Gay et al., 2009; Wiersma, 1995). Burns (1994) recommended that this type of pre-testing be carried out using people as similar as possible to the intended participants. As such, the survey designed for pre-service primary teachers enrolled in a Bachelor of Education program was tested using 32 primary Master of Teaching students enrolled at UTAS in 2011, the primary school teacher survey was tested using two primary school teachers known to the researcher, and the UTAS Faculty of Education teaching staff survey was pre-tested using two university staff members known to the research supervisors. Feedback was invited from the participants. The only issue that arose came from the Master of Teaching students, who indicated that their lack of education in IWB use made it difficult for them to respond in an informed manner to pedagogical statements/questions.

The interview schedules were trialled using primary school teachers known to the researcher. These pilot studies provided several benefits, one being an increase of the researcher's confidence in conducting the interview, and another being the enhancement of the researcher's ability to facilitate safe and thought-provoking interactions (Kvale, 1996). Trial runs were also used as research suggested that they may reduce interviewer bias through gaining experience in how to present the questions with the same manner, intonation, and expression (Neuman, 2004). In this way, the survey, information sheets, cover letters, Excel spreadsheets (for initial data entry), and interview schedule components of the research methodology were thoroughly tested and adjustments made according to feedback received.

3.8 Stage 1: Online Surveys

The quantitative first stage of this study gathered data from as many pre-service teachers enrolled in the Bachelor of Education primary program at UTAS, teaching staff in the UTAS Faculty of Education, and Tasmanian primary school teachers, as possible regarding their understandings, perceptions, and experiences regarding IWBs. The surveys were cross-

sectional, and designed to be administered once, gathering data from participants at a single point in time (Gay et al., 2009). They also sought to identify common links between responses to the items. In addition, the surveys were used to identify a pool of willing participants from each group who took part in the second part of this study.

To recruit the pre-service teachers enrolled at UTAS as participants for Stage 1, as well as teaching staff at UTAS, a detailed invitation was bulk-emailed to the entire population of pre-service teachers enrolled in the Bachelor of Education course at UTAS by Faculty of Education administration staff. Two weeks later the participation invitation was resent in order to enhance the response rate. To recruit Tasmanian primary school teachers from a variety of demographic backgrounds, permission was first sought and gained from the Department of Education, after which an informative letter was mailed to the principals of the Sandbridge, Southbury and Lockwood primary schools (pseudonyms) seeking permission for teaching staff to be invited to participate. The principal of Sandbridge immediately accepted, and forwarded the survey email to the teaching staff at the school. Several follow up telephone calls were needed to gain a response from the Southbury and Lockwood principals, which resulted in the decision not to participate. Subsequently, the principals of West Town, Heydon, Wyndham, Danville and Garwood primary schools (pseudonyms) were invited and followed up with telephone calls, but again negative participation responses were received. Hence, only one primary school participated. Due to the low primary school participation, research gathered from three Australian studies focused on primary school teachers' IWB use was included in the Literature Review (Chapter 2, Section 2.11), and discussed in Chapter 6 (Section 6.4). An information sheet accompanied the invitation, providing the details needed for participants to make an informed decision about what was involved before they decided whether or not to participate (Burns, 2000). Qualtrics (Qualtrics, 2015) software was selected for designing and delivering the survey, as this enabled it to be delivered electronically, securely and could be completed online. Furthermore, the completed participant responses could be exported directly into Excel and saved.

Completing the survey took an average of 14 minutes of each participant's time. The surveys' results were exported from Qualtrics (Qualtrics, 2015), and then examined. Tabulated answers were coded and open-ended answers were screened for patterns and then coded accordingly. Finally the data were broken down into three worksheets for ease of analysis using the Statistical Package for the Social Sciences (SPSS) software, Version 21.0

(SPSS Inc, 2012). In order to reveal underlying trends and patterns, descriptive statistics (represented graphically) were used (Tabachnick & Fidell, 2007). At the conclusion of the survey an option was included that enabled participants to indicate if they would be willing to take part in interviews (Stage 2 of this study) at a later date.

3.9 Stage 2: Semistructured Interviews

The purpose of Stage 2 was to probe more deeply into the factors impacting the formation of pre-service teachers' understandings, perceptions, and experiences regarding IWBs. Face-to-face semistructured interviews were used to explore the seven main variables as well as the key influential factors that were uncovered by the literature review and embedded in the survey. These interviews provided a vehicle for exploring unanticipated anomalies discovered in participants' answers to open-ended survey questions. Thus, an interview schedule was used as a guide so that when divergence from the standard instrument occurred to allow for opportunistic data gathering, the researcher could continue from where deviation from the schedule had occurred. Because qualitative research seeks to explore and understand the meaning behind social phenomena according to individuals' perceptions, the research approach taken in Stage 2 was suitable for grasping the variations, subtleties and interpretations that were likely to occur (Burns, 2000). Due to the distant location of most of the interviewees, it was necessary to conduct the interviews via telephone instead. Each interview was audio-recorded and transcribed for further analysis, because it was extremely unlikely that the interviewer would recall from memory, the entire conversation, nor the inflections with which words were said (Sacks, 1984b, as cited in Silverman, 2005). Furthermore, this method enabled the interviewer to listen and replay segments to ensure clarity of meaning (Burns, 2000).

3.10 Data Analysis

Descriptive statistics were used to summarise the numerical data into a more easily interpreted format (Colman & Pulford, 2006). In order to determine whether the mean difference between the university staff and pre-service teachers' responses to each of the 56 Likert statements was notable, independent *t*-tests were conducted (Burns, 2000; Nardi, 2003) using SPSS Version 21.0 (SPSS Inc., 2012). The responses to the 56 Likert statements were grouped for comparison according to which of the seven key variables (shown in Table 3.6-1) they related. To test that the level of variance error of the dependent variables was equal

across groups (Kinnear & Gray, 2008), Levene's test for equality of variances was used, resulting in equal variances.

A chi-square test is a "simple non-parametric test of significance" (Burns, 1994, p. 166), which Nardi (2003) described as suitable for determining whether significant relationships exist between variables (Nardi, 2003). It achieves this by establishing whether any differences found between expected and recorded proportions are likely to be the result of a sampling error or not (significant or non-significant association respectively) (Burns, 2000). Hence, chi-square tests, using SPSS Version 21.0 (SPSS Inc., 2012), were used to compare categorical data between the three participant groups, according to participants' age group, perceived capability with using IWBs, expectation for using IWBs, and type of IWB education received.

Analyses of the quantitative and qualitative data pertaining to this study are described in detail in the following sections.

3.10.1 Quantitative Data

Once the survey data collection for each participant group was completed, the data were exported from the Qualtrics (Qualtrics, 2015) software program into Microsoft Excel spreadsheets. The categorical data for questions pertaining to demographic information were generated through frequency counts. Microsoft Excel was used to create a table of demographic data, as well as pie, column and bar charts that were chosen specifically to best represent various aspects of this information. The data were then carefully checked, cleaned, text removed, and coded by the researcher for entry into SPSS Version 21.0 (SPSS Inc., 2012). This software has been used for over forty years and is the "most widely used program for statistics in the social sciences" (Neuman, 2004, p. 263). SPSS was then used to transpose the negatively-keyed Likert statements from the third section of the surveys to ensure the direction of the various statements were in alignment for analysis and discussion purposes (Neuman, 2004). SPSS (SPSS Inc., 2012) was also used to perform independent sample *t*-tests to compare the mean responses of pre-service teachers and UTAS staff to 56 Likert items. The *t*-test was chosen because the independent variable has two categories and the dependent variable was continuous (Hoy, 2010). The mean scores (averages) and standard deviations (extent from which the scores vary from the mean) of each item were examined, in order to gain a clearer understanding of the meaning of each score. Levene's

test for equality of variances/means (2-tailed) was applied to determine statistical significance ($p<.05$ or $p<.01$ were the levels used), to check that the results were not simply the result of chance factors (Neuman, 2004). Statistical tests of significance were used because they are a means of adding credibility to the data interpretations (Denscombe, 2007), thus the level of confidence in the findings and results of this study is increased. The researcher then examined the three surveys (pre-service teachers, university staff, and primary school teachers) and compiled a list of the questions common to all three surveys. Chi-square tests in a cross-tabulated contingency table were used to determine whether or not the categorical data gathered by the survey were related, and hence statistically significant (Qualtrics, 2011).

3.10.2 Qualitative Data

Each interview was audio-recorded, transcribed and returned to each interviewee for checking, amendment and validation. After this, they were read and reread, colour-coded, and systematically combed and each group cross-examined for themes and evidence relating to the research questions, with notes taken throughout. The researcher then applied data codes to each of the identified themes; these are considered to be "the most useful unit of analysis" (Burns, 2000, p. 589) for working with interview information. This categorising procedure was an integral part of the research process as it facilitated analysis and comparison of data, and enabled a sense of the overall data to be gained. Key points highlighted in the quantitative data were compared with the findings of the qualitative data; this process enabled the identification of five common themes (see Section 5.6 of Chapter 5).

3.11 Reliability and Validity

Quantitative and qualitative methodologies are recognised tools that interact in the practice of social research, with the power of each determined by their fit with the research questions (Kvale, 1996). Babbie (2008) posited that it is important for qualitative researchers to review the reliability and validity of their methodology to ensure it is as accurate as possible. Validity is a term that has many applications in research (Neuman, 2004). In this instance, it is referring to measurement validity, because it is concerned with how accurately the research methodologies used in this study measure what they are designed to measure (Babbie, 2008).

3.11.1 Validity of Quantitative Data

The validity of the online survey used in this study was enhanced through the application of the 'preview survey' and 'test survey' tools, two of the inbuilt optional testing functions that

are part of the Qualtrics (Qualtrics, 2015) software package used to construct the online survey. The preview option was used to review how each of the three surveys would appear to the survey participants to ensure it would look as was expected. It was also used to enable a trial run at answering the surveys in a testing mode. The test survey option was then used to generate a set of false test results for the purpose of viewing how the results would be presented. The test survey option also made it possible to check for flawed logic within the advanced functioning of the survey design. In this way, it was possible to ensure that advanced functions such as skip logic, which revealed questions based on each participant's answers, worked correctly, thus ensuring that the survey would operate as intended and that participants would receive questions that were applicable to them. In addition, statistical tests of significance were performed on the Likert items in the analysis stage of this study, which enhanced the validity of both the data interpretations and research findings (Denscombe, 2007).

3.11.2 Validity of Qualitative Data

The use of semistructured interviews strengthened the internal validity of this study, because it enabled the qualitative data gathered by the surveys and the researcher's interpretations of these to be cross-checked (Burns, 2000). To avoid potential misinterpretation of the data by the participant or interviewer (Altheide & Johnson, 1998), member checking, as suggested by Guba and Lincoln (1989) was employed in this study. Hence, the interview transcripts were returned to the interviewees for scrutiny. Interviewees were also invited to add further information that they felt was important.

A multiple approach to evaluating data, such as is employed in this study, is known as triangulation, and is recognised as "an important methodological issue in naturalistic and qualitative approaches to evaluation [in order to] control bias and establishing valid propositions because traditional scientific techniques are incompatible with this alternate epistemology" (Mathison, 1988, p. 13). Furthermore, triangulation through the combination of qualitative and quantitative research methods is recognised as potentially strengthening the validity and reliability of a study (Patton, 2002).

The face validity of a research instrument is "the extent to which a measuring instrument appears valid on its surface" (Jackson, 2006). The face validity of this study's research instrument is satisfactory as it is clear and unambiguous throughout; each section of the

survey includes introductory notes, and the Likert items are grouped according to which variable they are intended to investigate.

3.11.3 Reliability of Quantitative Data

One of the most commonly used measures of internal consistency of surveys and questionnaires is the Cronbach's coefficient alpha technique (Burns, 2000). As such, Cronbach's alpha was used in this study, through the use of SPSS Version 21.0 (SPSS Inc., 2012), to assess the internal reliability of the eight Likert statement items pertaining to each of the seven variables thought to influence technology use, and which are listed in Table 3.6-1. A minimum score of 0.70 is indicative of an acceptable standard of correlations between the items being tested (Nunnally, 1975b); the more correlations found between the items being tested, the higher the resulting score. Scores above 0.70 indicate acceptable reliability levels, and scores below 0.70 mean that more correlations are required before the tool can be considered reliable (Nunnally, 1975b). As can be seen in Table 3.11-1, the results of the Cronbach's alpha tests were all between 0.89 and 0.96, well above the acceptable minimum reliability level indicated by Nunnally (1975b).

Table 3.11-1

Cronbach's Alpha Reliability Test

Variable Investigated	Cronbach's α
Perceived usefulness of IWBs	0.89
Attitude towards IWB use	0.90
IWB Self-Efficacy	0.90
Technological Complexity of IWBs	0.94
Facilitating conditions	0.94
Pedagogy	0.96
Perceived ease of use of IWBs	0.92

3.11.4. Reliability of Qualitative Data

The term 'reliability' is concerned with dependability, meaning how likely it would be that the same results would be achieved if the process was repeated (Babbie, 2008). To this end, the data-gathering and decision making processes underpinning this study have been clearly

and precisely documented. In addition, both the validity and reliability were enhanced in this study by the use of pilot studies. Although more time and effort was required by the researcher to include this phase into a research project, it enabled the research instrument to be refined through the reduction of errors and biases (Neuman, 2004). The pilot studies enabled the quantitative questions and statements, as well as the qualitative questions, to be tested for consistency of understanding by participants.

3.12 Summary

Chapter 3 has provided in-depth details of the research methodology underpinning this study, with specifics given regarding the structure and design of the survey. The results are presented in the following chapter, Chapter 4.

Chapter 4
SURVEY RESULTS

4.1 Chapter Outline

Chapter 4 describes in detail the results obtained from the three surveys (Appendices E-G). Survey responses were received from 145 pre-service teachers enrolled in the Bachelor of Education primary program at UTAS, in 2011/2012, 18 teaching staff in the Faculty of Education at the UTAS, and two teachers from the Sandbridge Primary School (pseudonym). The demographics of the participants in this study are presented in Table 3.5-1 (Section 3.5 of Chapter 3). As noted in Section 3.8 (Chapter 3), the low number of teacher participants required the literature review of this study to be broadened to include existing research into IWBs in Australian Schools (Section 2.11, Chapter 2).

Section 4.2 of this chapter provides an examination of the survey data collected from the pre-service teachers that related to their readiness to use IWBs. These data provide information directly related to Research Question 1: *What is the nature and extent of preparation of the pre-service teachers enrolled in the Bachelor of Education course at UTAS for using IWBs as a teaching tool?*

Section 4.3 focuses on data gathered from survey responses of teachers at Sandbridge Primary School regarding their use of IWBs. This links directly to Research Question 2: *What is the nature and extent of IWB education received by teachers at a selected local Tasmanian primary school and how do they incorporate IWBs in their teaching practice?*

Section 4.4 presents the responses of UTAS teaching staff to questions in the survey regarding their experiences with IWBs. This links directly to Research Question 3: *What is the nature and extent of education regarding IWB use as a teaching tool received by UTAS Education teaching staff and how do they incorporate IWBs in their teaching practice?*

Section 4.5 comprises an examination of responses to survey items regarding what may have influenced the pre-service teachers, primary school teachers, and UTAS teaching staff with regard to their use of IWBs. This section is linked directly to

Research Question 4: *What has influenced these pre-service teachers, primary school teachers, and UTAS Education teaching staff, with regard to their use of IWBs in their current teaching practice?*

Section 4.6 reviews key differences between the perceptions of pre-service teachers and university teaching staff in relation to the variables examined in the survey.

4.2 Survey Data Related to Research Question 1

Research Question 1: *What is the nature and extent of preparation of the pre-service teachers enrolled in the Bachelor of Education course at UTAS for using IWBs as a teaching tool?*

Only 12 (8%) of the 145 pre-service teachers who participated in the survey indicated they had received education of any sort on the use of IWBs during their teacher education course at university. The responses given by pre-service teachers who did not use an IWB during their teacher education course as to why this was the case are presented in Figure 4.2-1. The most common reason given was that there was not one available for them to use. Quite a few pre-service teachers indicated that they did not have the opportunity on the occasions when one was available, and some saw one being used, but did not use it themselves. Thirteen (11%) of the respondents noted that they could not access an IWB on campus because they were studying via distance. Of the three respondents who indicated that they purposely chose not to use an IWB when they had the opportunity, two cited lack of confidence in themselves as the reason, and one indicated that the technology was unreliable. Although they were aware of the existence of IWBs, the two respondents who chose the 'other' category had not seen or experienced any form of IWB use and did not know whether IWBs were on campus. In addition, they had not seen or experienced any form of IWB use in a classroom environment, which could be attributed to the fact that they had not yet been on professional school experience because they were in their first year of the course.

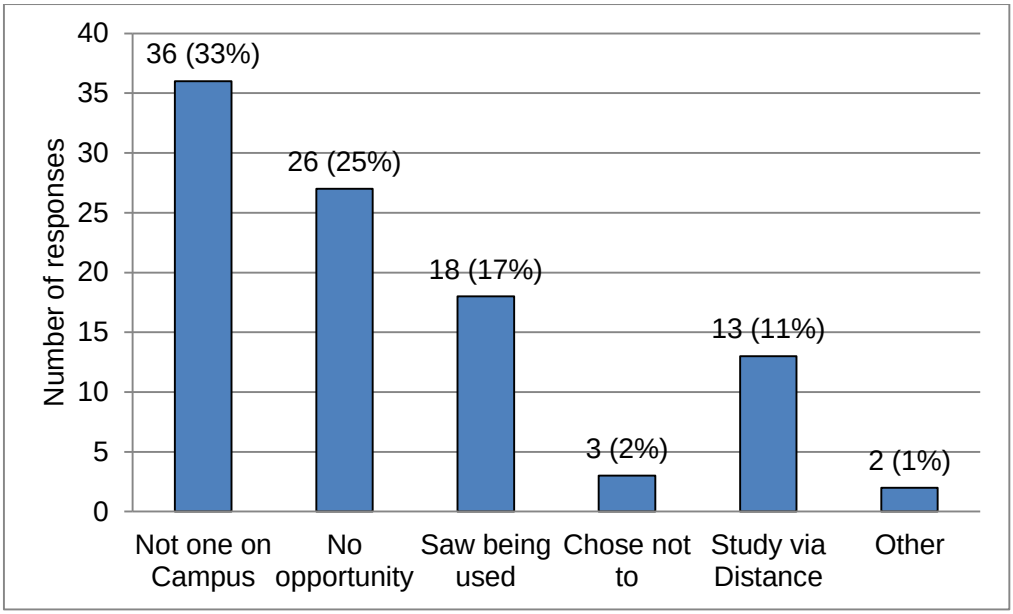

Figure 4.2-1. Reason for Lack of IWB Use during Teacher Education Course.

Just over one-quarter of the pre-service teacher survey respondents saw an IWB used in some form, including as a screen for a data projector, whilst on campus during their teacher education course (not including their time spent on professional experience). This means that nearly three-quarters of pre-service teachers did not see an IWB used at all.

When considered in relation to campus of study, Figure 4.2-2 shows that there was very little variation between the numbers of respondents who used an IWB during their teacher education course. Between 36 and 42 (25-29%) pre-service teachers who studied at one of the three campuses of UTAS indicated that they had used an IWB during this time. Similarly, 39 (27%) pre-service teachers who selected 'other', i.e. had studied at a different university for part of their teacher education course, or who studied partly via distance, had also used an IWB during their course. However, it is worth noting that of the pre-service teacher survey participants who had used an IWB during their teacher education course, six had studied at more than one of the UTAS campuses, or had also selected the 'other' option, so it is possible that these figures are not completely accurate as they may have used an IWB at one campus but not the other.

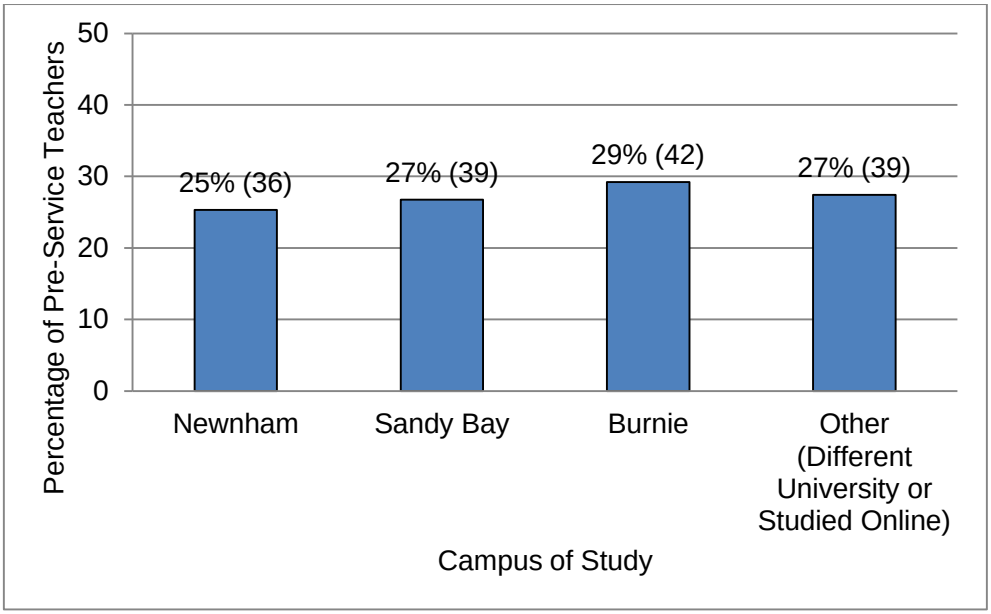

Figure 4.2-2. Percentage of Pre-Service Teachers who Used an IWB during their Teacher Education Course by Campus.

Analysis of the percentage of pre-service teachers who received education in IWB use according to their year of teacher education is shown Figure 4.2-3. Regardless of the year, education in IWB use was minimal, although slightly higher in 4th year. This study occurred concurrently with the TTF project (CoA, 2011); although the project was not mentioned by the participants of this study, it is possible that it may have influenced the slightly higher result by 4th year pre-service teachers.

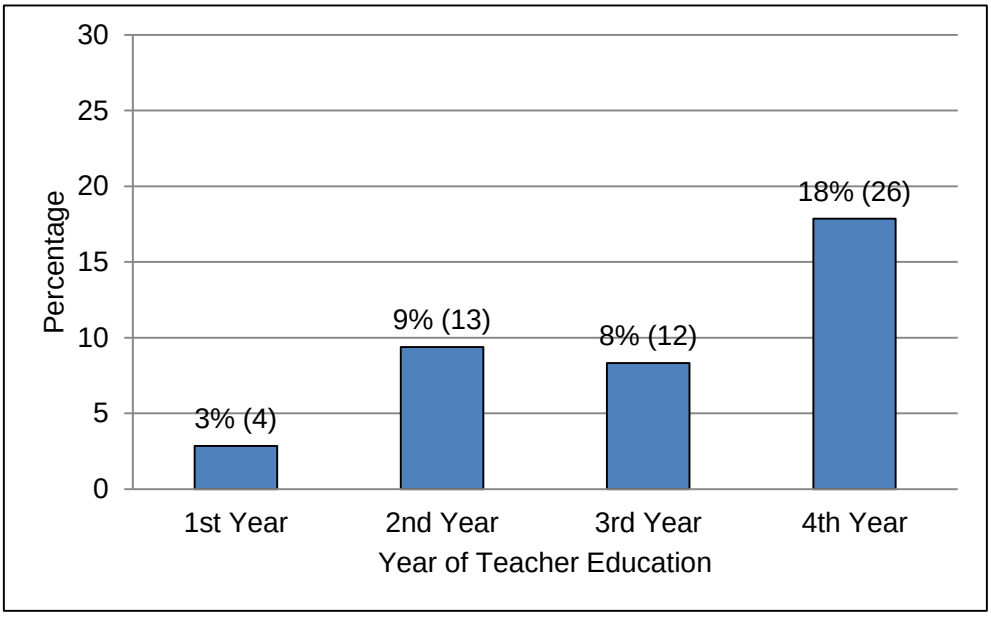

Figure 4.2-3. Percentage of Total Pre-Service Teacher Participants who received Education in the Use of IWBs According to Year of Teacher Education.

As can be seen in Figure 4.2-4, only six (4%) of the 145 pre-service teachers who participated in this study indicated that they had seen an IWB used often at university. A further eleven (8%) indicated one was used occasionally, and 20 (14%) indicated that they had seen one used rarely (Figure 4.2-4). The vast majority reported not having seen one used at all.

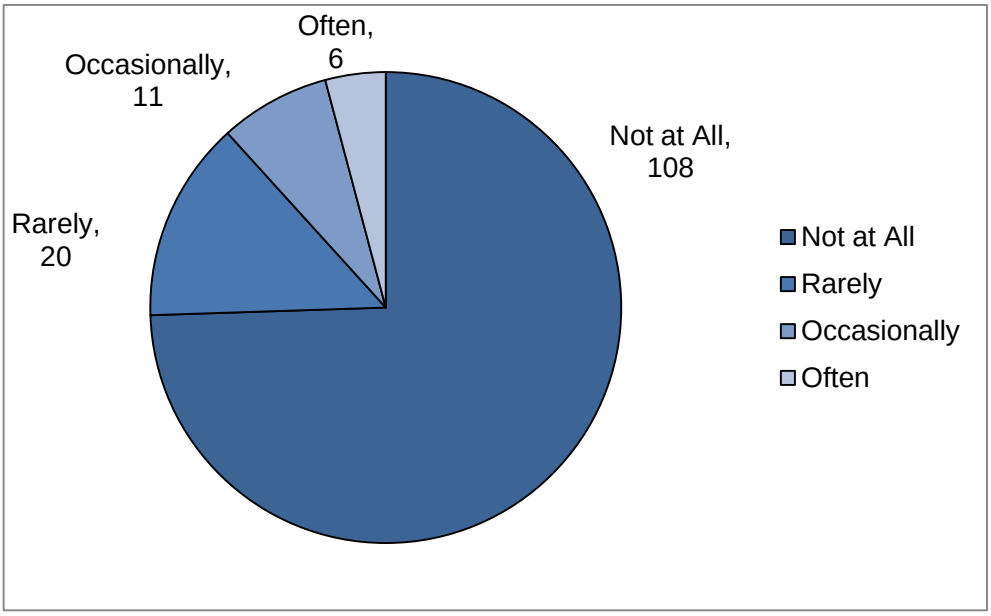

Figure 4.2-4. How Often did Pre-Service Teachers see an IWB Used at UTAS?

The vast majority of pre-service teachers indicated that IWBs were part of their professional experience, with 131 (91%) indicating they saw an IWB in the classroom. Figure 4.2-5 shows that of the 145 pre-service teachers, 90 (62%) observed a teacher using an IWB, 72 (50%) saw students interacting with an IWB, 30 (21%) often used an IWB themselves and 40 (28%) used an IWB occasionally themselves. There were a further 13 (9%) pre-service teachers who rarely used an IWB due to his/her lack of skills, lack of confidence, lack of opportunity, and/or technical difficulties experienced.

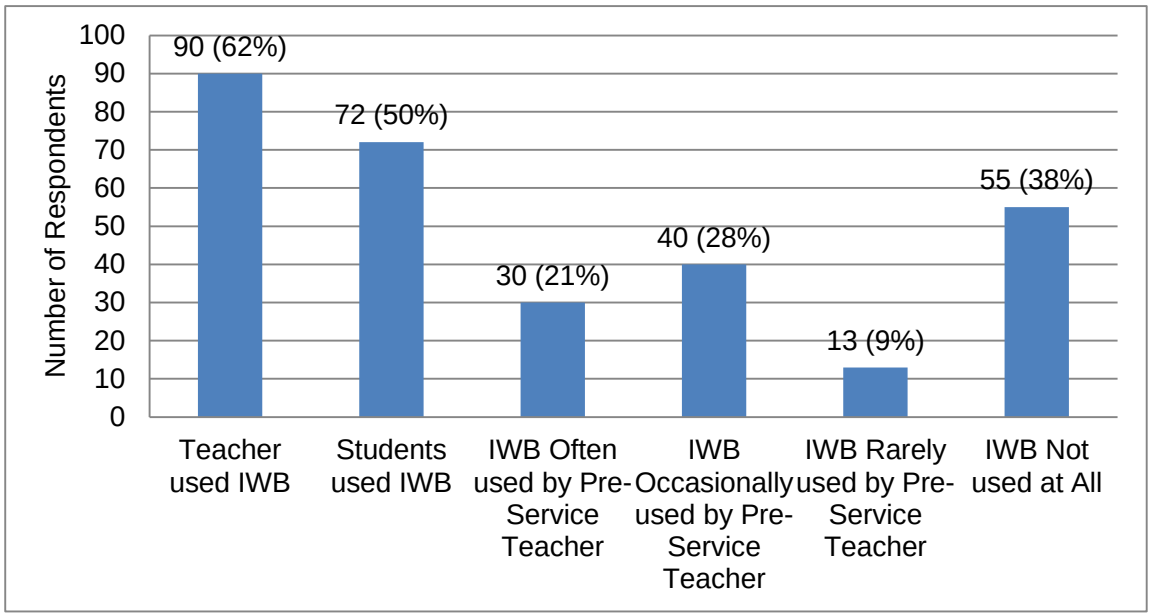

Figure 4.2-5. IWB Use during Professional Experience.

There was an assortment of reasons provided by the 55 (38%) pre-service teachers who indicated they were not able to use an IWB as part of their professional experience. Two of these pre-service teachers had not yet attended a professional experience, and one felt that its use had not been suitable for their planned activity. One indicated that neither they nor their colleague teacher knew how to use the IWB, hence it was not used. Thirteen (9%) pre-service teachers did their professional experience in classrooms that were not equipped with an IWB. Although all of the remaining 15 (10%) pre-service teachers did their professional experience in classrooms that were equipped with IWBs, seven (5%) were not given the opportunity to use it, and eight (6%) indicated that the IWB was not used by anyone at all.

Table 4.2-1 shows the curriculum areas in which pre-service teachers had seen IWBs used at university during their teacher education course, compared with the curriculum areas they observed IWBs being used for during their professional experience. The data in the table are presented in order of most common to least common curriculum use observed by pre-serviced teachers during their professional experience. Pre-service teachers observed IWBs used most frequently in Mathematics education units whilst on campus and for teaching Mathematics whilst on professional experience, although it was more common in the latter than the former. IWBs were

used far less frequently at university than they were on professional experience for Literacy, Science and SOSE learning. The other notable difference was the higher number of curriculum areas that pre-service teachers observed IWBs to be used for in the classroom whilst on professional experience, compared to the low number at UTAS; 26 (18%) pre-service teachers indicated they had observed an IWB being used across the curriculum whilst on professional experience.

Table 4.2-1
Pre-service Teachers' Observations of IWB Use Regarding Curriculum Area

Curriculum Area	No. of Obs at Uni n=145 No. (%)	No. of Obs during Prof. Exp. n=145 No. (%)
Mathematics	23 (16)	60 (41)
Literacy	8 (6)	59 (41)
All Areas	0 (0)	26 (18)
Science	4 (3)	22 (15)
SOSE	2 (1)	16 (11)
Art	3 (2)	9 (6)
Integrated Studies	1 (1)	6 (4)
History	0 (0)	4 (3)
LOTE	0 (0)	3 (2)
HPE	0 (0)	3 (2)
IT	7 (5)	2 (1)
Geography	0 (0)	2 (1)
Drama	0 (0)	1 (1)
Music	1 (1)	1 (1)
Teaching Pedagogy	2 (1)	N/A
Foundations of Teaching	2 (1)	N/A

A comparison of which IWB functions pre-service teachers observed being used on campus during their teacher education course, and during their professional experience, shows that a wide variety was used in both instances (Table 4.2-2). The data in Table 4.2-2 are presented in order of most common to least common IWB functions observed by pre-service teachers. In nearly all cases, there were double or triple the instances of each type of function evident during professional experience

compared to the number observed in pre-service teachers' university teacher education course. During professional experience, IWBs were frequently observed being used for the purpose of annotating or saving displayed pages, recording learning, or sharing student work, whereas this was rarely seen at university in teacher education units. However, there was one IWB function that was observed more frequently at university than in classrooms whilst pre-service teachers were on professional experience, this being the use of National Curriculum materials in conjunction with IWBs.

Table 4.2-2
Pre-service Teachers' Observations of IWB Function Use

IWB Function	On Campus n=145 No. (%)	Prof. Exp. n=145 No. (%)
Data Projector	55 (38)	78 (54)
Downloading images/sounds	29 (20)	66 (46)
Colour/shading/highlighting items	22 (15)	56 (39)
Subject specific software	19 (13)	54 (37)
Downloading from internet	23 (16)	53 (37)
Search engine	29 (20)	51 (35)
Revisiting materials	23 (16)	51 (35)
Preloading Teaching Pages	28 (19)	49 (34)
Subject websites	23 (16)	49 (34)
Dragging/hiding items	20 (14)	49 (34)
Movement/animation	25 (17)	43 (30)
Annotating displayed items	12 (8)	38 (26)
Saving Work	19 (13)	37 (26)
Digitally record interactive learning sequences	13 (9)	31 (21)
National curriculum materials	24 (17)	18 (12)

Aside from more instances of education in using key IWB tools and developing an interactive teaching style during professional experience, there was little difference in the type of IWB education received by pre-service teachers during their teacher

education course at university compared with the IWB education they experienced during their professional experience (Table 4.2-3). The data in Table 4.2-3 are presented in order of most common to least common type of IWB education received by pre-service teachers during their professional experiences. However, the high number of observations of IWB use noted by pre-service teachers whilst on the professional experience shown in Table 4.2-2 is not reflected in the amount of specific IWB education they received during their professional experience.

Table 4.2-3

Type of IWB Education Received by Pre-Service Teachers

Type of IWB Education	UTAS n=145 No. (%)	Prof. Exp. n=145 No. (%)
Key IWB Tools	8 (6)	14 (10)
Interactive Teaching Style	7 (5)	13 (9)
Locate Internet Resources	10 (7)	10 (7)
Student Motivation	7 (5)	10 (7)
IWB Dedicated Software	6 (4)	9 (6)
Embed Sound/ Movie Files	6 (4)	9 (6)
Use IWBs to suit Different Learning Styles	6 (4)	9 (6)
Connecting to Data Projector	8 (6)	8 (6)
Reinforce Learning	6 (4)	8 (6)
Subject Specific Resources	5 (3)	6 (4)
Recap Previous Lessons	5 (3)	6 (4)
Trouble Shooting	7 (5)	5 (3)
Create Sequences and Diagrams	5 (3)	5 (3)
Create a Resource Bank	6 (4)	4 (3)

Seventeen (12%) pre-service teachers received specific education in the use of an IWB during their professional experience. A comparison of the source of IWB education received by pre-service teachers (Table 4.2-4) shows that there was a greater opportunity to learn from local experts, watching staff members, and watching and asking peers whilst on professional learning than there was at university during their teacher education course. The data in Table 4.2-4 are presented in order of most common to least common source of IWB education experienced by pre-service teachers during their professional experience.

Table 4.2-4

Comparison of Source of IWB Education

Source of IWB Education	At University n=145 No. (%)	During Prof. Exp. n=145 No. (%)
Self Exploration	9 (6)	12 (8)
Watch Peers	6 (4)	12 (8)
Ask Peers	3 (2)	8 (6)
Watching Staff Member	1 (1)	7 (5)
External Expert	8 (6)	6 (4)
Local Expert	0 (0)	5 (3)

In response to being asked whether they thought they would be expected to use an IWB as a fully qualified teacher, the overwhelming majority (135, 93%) of pre-service teachers indicated that they thought they would. Indeed, only one (<1%) thought she wouldn't need to use one, and just nine (6%) indicated that they were not certain. However, only half (72) of the pre-service teachers who took part in this study felt that they would be prepared to use an IWB. Additional optional comments were offered by 41 (28%) pre-service teachers regarding their perceived capability for using an IWB when they secured a teaching position. There were 32 (22%) comments from pre-service teachers indicating that they felt that they needed IWB education. Five (3%) indicated that they needed to learn more, as they were familiar with the basic functions of IWBs, but needed more professional learning to be able to use an IWB effectively. Three (2%) felt that their confidence with using technology would help them learn to use an IWB once they had one if they didn't receive specialised training, and one intended on pursuing IWB education in her own time to ensure they would be capable when employed in a teaching capacity.

Although all pre-service teachers identified numerous benefits of using an IWB as a teaching tool, 24 (17%) indicated that they thought the drawbacks associated with using IWBs outweighed the benefits. Perceptions of using an IWB consuming too much time, the additional time taken for learning new software, and the unreliability

of the technology were the three main drawbacks identified by these pre-service teachers (Figure 4.2-6), however none of the pre-service teachers thought that IWBs were a complete waste of time.

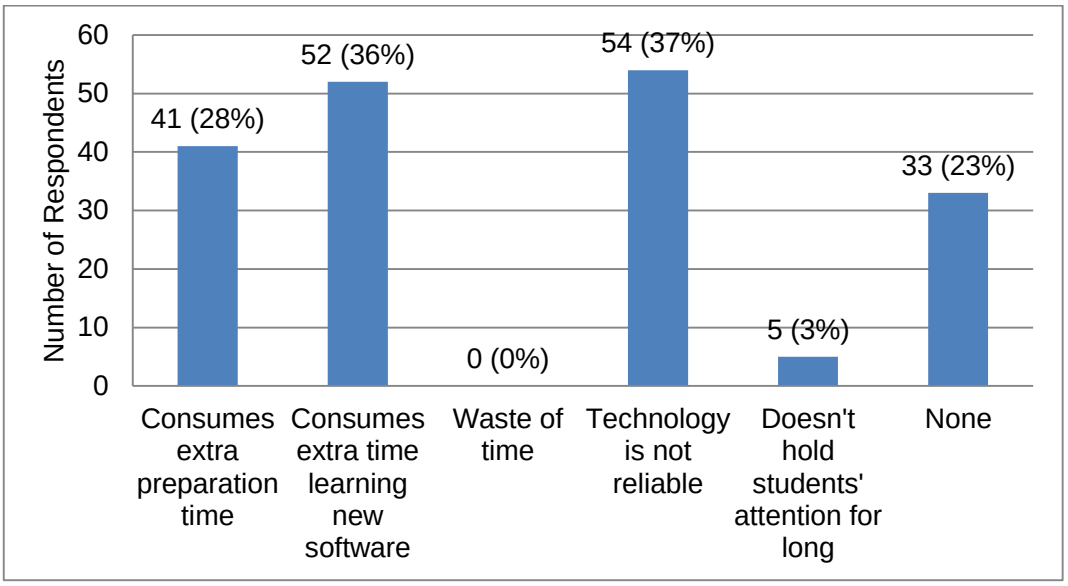

Figure 4.2-6. Drawbacks Associated with IWBs by Pre-Service Teachers.

4.3 Survey Data Related to Research Question 2

Research Question 2: *What is the nature and extent of IWB education received by teachers at a selected local Tasmanian primary school and how do they incorporate IWBs in their teaching practice?*

The 2 primary school teachers who took part in the survey were Jane and Diane (pseudonyms). Jane had been teaching for over 11 years, whilst Diane had been teaching for between 6 and 10 years. Both teachers indicated that they were usually confident with technology and had been using computers regularly for between 5 and 10 years, although Diane had experienced a broader range of software than Jane. Both teachers had an IWB permanently in their classroom; Jane had had one in her classroom for more than 6 years and Diane had had one for over 3 years. Jane and Diane both believed that there was a clear expectation for them to use an IWB in their teaching. Diane believed that she was capable of using an IWB effectively and that her pedagogy was suited to using an IWB; Jane did not think the same of herself.

Neither teacher had received education in IWB use during their teacher education course. Jane was not certain whether there was an IWB on campus at the time or not. In Diane's case, there was an IWB, but it had not been used, nor had there been any

specialised training available that she recalled. Neither had experienced IWBs when they were high school or primary school students because IWBs did not exist in educational facilities at the time. Both teachers indicated that they used their IWBs across all subject areas as a daily tool. However, as can be seen in Table 4.3-1, Diane's use of IWB functions was far more extensive than was Jane's.

Table 4.3-1

IWB Functions Used by Jane and Diane

IWB Function	Jane	Diane
Data Projector	Yes	Yes
Preloading Teaching Pages	Yes	Yes
Saving Work	Yes	Yes
Revisiting materials	Yes	Yes
Downloading from internet	Yes	Yes
Subject specific software	Yes	Yes
Search engine	Yes	Yes
Subject websites	Yes	Yes
National curriculum materials	Yes	Yes
Digitally record interactive learning sequences	No	Yes
Display student work	No	Yes
Colour/shading/highlighting items	No	Yes
Downloading images/sounds	No	Yes
Annotating displayed items	No	Yes
Movement/animation	No	Yes
Dragging/hiding items	No	Yes

Both teachers had received specific education in the use of an IWB during their teaching career at Sandbridge Primary School from external experts (staff from the company who sold the IWBs) coming to their school. Despite the fact that they had received the same initial professional learning, when asked to indicate the type of IWB education they had received during this time, the aspects Jane and Diane recalled learning about were different. Details of the type of IWB education recalled by Jane and Diane are shown in Table 4.3-2.

Table 4.3-2

Type of IWB Education Received by Jane and Diane

Type of IWB Education Received	Jane	Diane
Connecting to Data Projector	No	Yes
Subject Specific Resources	No	Yes
Use IWBs to suit Different Learning Styles	No	Yes
IWB Dedicated Software	No	Yes
Key IWB Tools	Yes	No
Locate Internet Resources	Yes	No
Embed Sound/ Movie Files	No	No
Trouble Shooting	No	No
Reinforce Learning	No	No
Student Motivation	No	No
Interactive Teaching Style	No	No
Recap Previous Lessons	No	No
Create Sequences and Diagrams	No	No
Create a Resource Bank	No	No

As can be seen in Table 4.3-3, Diane perceived there to be more benefits associated with using an IWB as a teaching tool than did Jane.

Table 4.3-3

Benefits of Using an IWB Perceived by Jane and Diane

Benefits of Using an IWB	Jane	Diane
Student engagement	Yes	Yes
Student motivation	Yes	Yes
Capitalise on Internet resources	Yes	Yes
Organisational tool	Yes	Yes
Engage students with different learning styles	Yes	Yes
Supports teacher directed learning	Yes	Yes
Facilitates student directed learning	Yes	Yes
Improves teacher's computer skills	Yes	Yes
Convenience in projecting items	Yes	Yes
Modern teaching	No	Yes
Utilise software to support teaching	No	Yes
Flexibility in group teaching	No	Yes
Aligns with your teaching pedagogy	No	Yes
Improves students' computer skills	No	Yes

Jane thought that using an IWB for Mathematics, especially for teaching 3D shapes and fractions, was particularly effective in her experience. Diane gave two examples of effective IWB use; using Scootle as a whole class activity to teach about timetables, and allowing small groups to work on a Mathletics site for learning a particular topic. Jane did not provide an example of poor use of an IWB; Diane, however, described the writing up of lists for students to do on Easiteach (IWB software) as you would a regular whiteboard to be a waste of a valuable resource.

Although Diane did not believe there were any drawbacks associated with using an IWB, Jane was of a different opinion. She indicated that using an IWB took more time in lesson preparation, as well as in learning new software, and felt that the technology was not reliable. However, both Jane and Diane felt the benefits outweighed the drawbacks.

Jane suggested that teachers needed to be given more time to find good resources. Furthermore, she stated that "IWBs are a good thing, but I don't have the time to make the most of them … if you don't use a function all the time you tend to forget".

4.4 Survey Data Related to Research Question 3

Research Question 3: *What is the nature and extent of education regarding IWB use as a teaching tool received by UTAS Education teaching staff and how do they incorporate IWBs in their teaching practice?*

Of the 18 UTAS Faculty of Education teaching staff who participated in the survey, four (22%) staff members, Fiona, Liz, Nathan and Paul (pseudonyms), indicated that they had received education in IWB use whilst employed at university. The education in IWB use received by Fiona was by far the most extensive of the four. Liz and Fiona had learned from external experts coming to the university, whereas Nathan and Paul received their IWB education from recognised experts within the university community. Fiona and Paul also spent time exploring IWBs themselves, asked colleagues for help, and learnt from students. The reason given by ten (56%) of the remaining staff members for their lack of IWB education was that none was available. Three (17%) more staff attributed their lack of IWB professional learning to a lack of time due to personal circumstances and/or the part time nature of their positions,

whilst the remaining staff member indicated that a personality clash with IT staff prevented training from taking place.

All university teaching staff participants had also taught at primary and/or secondary level during their careers. Three staff members, John, Maxine and Tony, indicated that they had received professional learning using specialised IWB software (Smart Tools, Promethean, and Easiteach respectively) during their teaching career before university employment. No staff members had received education in IWB use of any sort during their own teacher education course due in 15 (83%) cases to the fact that IWBs had not existed in educational contexts at the time; however, one staff member, Tom had seen an IWB used in a SOSE unit. The other two staff members, Mark and Sam indicated that IWBs had existed when they did their teacher education course, however neither had had the opportunity to use one. Mark and Sam were also the only two staff members who indicated that IWBs had existed when they were at school, although neither recalled using one during their schooling. Mark recalled IWBs being used by teachers quite extensively across the curriculum, whereas Sam was aware they existed in the school, but could not recall seeing one used during this time. Table 4.4-1 compares the types of IWB education received by the staff members while employed at university, with the education they received as a teacher before joining the university. The data in the table are presented in order of most common to least common type of IWB use that teaching staff had learned about whilst employed at UTAS.

Table 4.4-1

UTAS Teaching Staff IWB Education Pre and Post University Employment

Type of IWB Education	Post Uni n=18 No. (%)	Pre Uni n=18 No. (%)
Connecting to Data Projector	4 (22)	3 (16)
Key IWB Tools	4 (22)	3 (16)
IWB Dedicated Software	3 (16)	3 (16)
Trouble Shooting	2 (11)	3 (16)
Locate Internet Resources	2 (11)	3 (16)
Embed Sound/ Movie Files	2 (11)	3 (16)
Create Sequences and Diagrams	2 (11)	3 (16)
Student Motivation	2 (11)	2 (11)
Subject Specific Resources	2 (11)	2 (11)
Reinforce Learning	2 (11)	1 (5)
Interactive Teaching Style	2 (11)	1 (5)
Use IWBs to suit Different Learning Styles	2 (11)	1 (5)
Recap Previous Lessons	1 (5)	2 (11)
Create a Resource Bank	0 (0)	1 (5)

Ten (56%) university teaching staff members indicated they had used an IWB in their teaching career at university; the range of curriculum areas in which they reported having used them are listed in Table 4.4-2, in order of most to least used.

Table 4.4-2

UTAS Teaching Staff Use of IWBs by Curriculum Area

Curriculum Area	Usage at University n=18 No. (%)
Mathematics	2 (11)
IT	2 (11)
Foundation Studies	2 (11)
Inclusive Education	2 (11)
Literacy	1 (5)
Professional Studies	1 (5)
Health and Wellbeing	1 (5)

Table 4.4-3 shows the ways in which university staff reportedly used IWBs as a teaching tool for their teacher education courses. The data in the table are presented in order of most common to least commonly used IWB function. Tony commented that his use of IWBs at university was limited to basic navigation and data projection as his IWB education at his prior teaching job had been using Easiteach which is an IWB dedicated software program that wasn't available to him at UTAS at the time. Hence, Tony's unfamiliarity with the board and its native software made it difficult for him to transfer his skills without additional learning.

Table 4.4-3

UTAS Teaching Staff Use of IWB Functions

IWB Function	Usage at University n=18 No. (%)
Data Projector	9 (50)
Revisiting materials	6 (33)
Downloading from internet	5 (28)
National curriculum materials	5 (28)
Search engine	5 (28)
Preloading Teaching Pages	4 (22)
Display student work	4 (22)
Subject specific software	4 (22)
Subject websites	4 (22)
Downloading images/sounds	4 (22)
Colour/shading/highlighting items	4 (22)
Dragging/hiding items	4 (22)
Annotating displayed items	3 (17)
Movement/animation	2 (11)
Digitally record interactive learning sequences	2 (11)
Saving Work	1 (5)

Further to university staff responses, a lack of opportunity and lack of available education in their use were the two predominant reasons given by the remaining eight staff members as to why they had not used an IWB in their teaching (Figure 4.4-1). The lack of IWBs on campus was another notable reason given by two staff members.

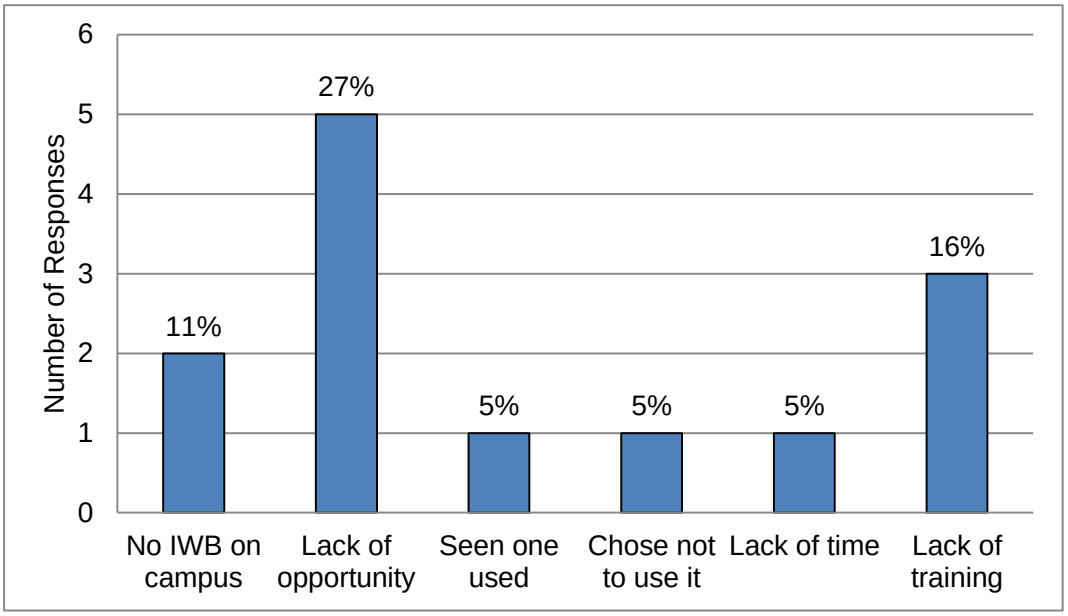

Figure 4.4-1. Reasons UTAS Teaching Staff had not Used an IWB in their Teaching.

As can be seen in Figure 4.4-2, only four (22%) of the university staff members who completed the survey believed there was an expectation from the university for them to use an IWB in their teaching. Two of these university teaching staff members, Liz and Fiona, were the only two who indicated they had consistent access to an IWB when they were teaching. However, a further six (33%) indicated that access depended on room allocation/availability, whilst the remaining ten (56%) staff members did not have access at all. Eight (44%) staff members did not believe there was an expectation for them to use an IWB, while six (33%) staff members were unsure if there was an expectation or not.

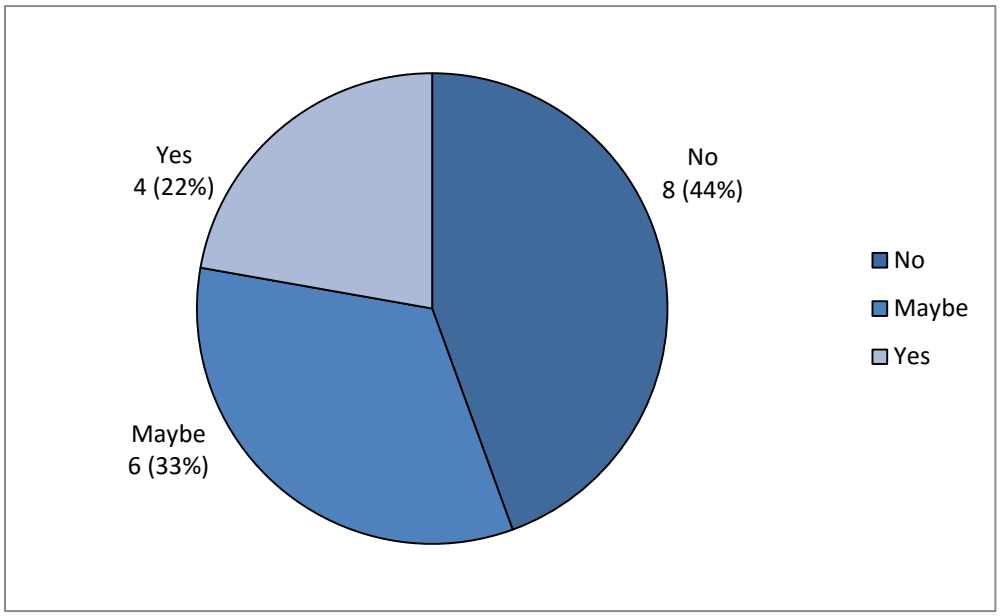

Figure 4.4-2. Did UTAS Teaching Staff think there was an Expectation for them to Use IWBs in their teaching?

Additional information provided by the staff members who were uncertain about the expectation for using an IWB is shown in Table 4.4-4. Of particular note is that four (22%) staff members (David, Mark, John and Paul) perceived there was an expectation from students for staff to use IWBs. Two (11%) staff members (David and Paul) felt there was a growing expectation for IWB use, whilst Maxine suggested that there should be. Michael felt it may have been expected but that this was unrealistic for him with regard to his limited available time.

Table 4.4-4
Additional Information

Staff Member (pseudonym)	Additional Information
David	They are just being installed and discussion concerning use is apparent though not proactive in training and expectations.
Maxine	There should be.
Mark	Students may expect it and practising teachers may expect us to, but there is no formal requirement as far as I know.
Michael	It is one of the competencies we are asked to cover--BUT who has the time to cover them all!!!- need ICT units X2 to cover these things.
John	By some students but not by university staff.
Paul	Demand from students to have experience - some increase in expectation from faculty but limited provision at this point.

As can be seen in Figure 4.4-3, eight (44%) of the staff members who completed the survey indicated that they felt capable of using an IWB effectively. Three (17%) staff did not think they were capable, whilst the remaining seven (39%) indicated that they felt more education in their use was needed to become familiar enough with the IWBs and software for them to become effective users.

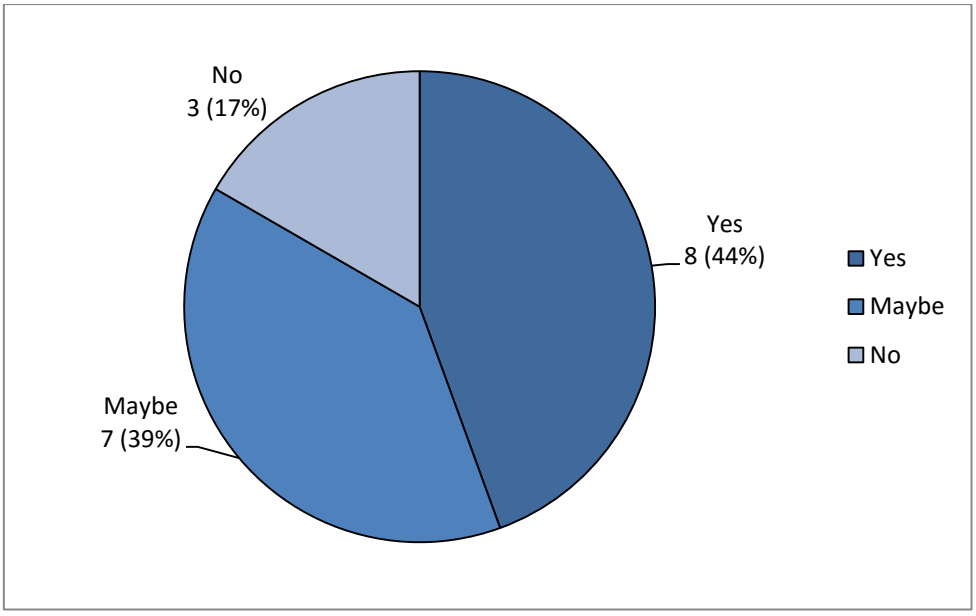

Figure 4.4-3. Did UTAS Teaching Staff believe they are Capable of Using an IWB Effectively?

All but one university staff member identified benefits associated with using an IWB as a teaching tool; indeed, many identified multiple benefits. The exception, Michael, thought that IWBs were a waste of time, were unreliable, were unsuitable for large lecture groups, did not hold students' attention for long, and that there was not adequate access on campus.

When asked to describe an example of effective use of teaching with an IWB, most respondents indicated that having students interact with the IWB was very important. Responses generally revolved around engaging students through flexible, subject specific software, or software that enabled the creation of mind maps or other diagrams. Other responses included integrating IWBs into lessons, modelling student-centric teaching practice, loading lessons, and supporting presentation and demonstration purposes. When asked to give an example of poor use of an IWB, all

respondents described using it as a projector screen and neglecting its interactive potential.

4.5 Survey Data Related to Research Question 4

Research Question 4: *What has influenced these pre-service teachers, primary school teachers, and UTAS Education teaching staff, with regard to their use of IWBs in their current teaching practice?*

The survey participants' responses to the Likert statements (as described in Chapter 3, Section 3.6.1) in the survey enabled the researcher to investigate each of the seven variables thought to influence technology use, as identified in the Literature Review (Chapter 2, Section 2.9) and listed in Chapter 3, Table 3.6-1, with regard to IWB use. Eight statements were generated for each of the seven variables, and each group of statements was clearly identified for participants in the survey according to which variable it was investigating. The 165 respondents who participated in the survey were comprised of 145 pre-service teachers, 18 UTAS Faculty of Education teaching staff, and two primary school teachers (see Chapter 3, Table 3.5-1). Thus, 165 responses to the eight Likert statements pertaining to each variable generated 1320 responses. Because there were seven variables being investigated, the number of responses to the Likert statements amounted to 9240 in total. Analysis of survey results indicated no significant differences between responses of male and female participants or between age groups (see Appendix L & M respectively). The responses to each of the seven variables are examined in the following seven sections.

4.5.1 Analysis of Responses to Likert Statements Investigating Participants' Perceived Usefulness of IWBs

The eight Likert statements that investigated the first potentially influential variable, Perceived Usefulness of IWBs, are shown in Table 4.5.1-1. The table includes the mean, standard deviation, *t*-value, degrees of freedom, and significance (2-tailed) value gained from independent *t*-tests comparing the mean responses of pre-service teachers and university teaching staff.

Table 4.5.1-1

Participants' Perceived Usefulness of IWBs

Item No.	Item Statement	Pre-Service Teachers Mean	Pre-Service Teachers Std. Dev.	UTAS Staff Mean	UTAS Staff Std. Dev.	*t*	*df*	Sig. (2-tailed) *p*
1.	An IWB is a useful teaching tool	4.55	0.562	1.78	1.003	11.458	18.604	.000**
2.	IWBs are suitable for my intended teaching area	4.15	0.906	3.50	1.543	2.548	138.000	.012*
3.	It is not difficult to think of ways to use an IWB	4.02	0.843	3.33	1.372	2.926	138.000	.004**
4.	Using an IWB as a teaching tool will make me a better teacher	3.49	1.022	3.17	1.425	1.192	138.000	.235
5.	Using an IWB will improve my teaching	3.72	0.836	2.56	1.423	3.389	18.767	.003**
6.	Knowing how to use an IWB will assist my career	3.91	1.121	2.94	1.626	2.435	19.454	.025*
7.	IWBs are not just a passing fad	4.22	0.733	3.33	1.455	2.542	18.293	.020*
8.	IWBs make it easier to re-cap teaching points	3.96	0.807	2.11	1.132	8.573	138.000	.000**

* $p<0.05$.

** $p<0.01$.

Statistically significant differences were found relating to all statements, except for Statement 4. Overall, these results indicate that pre-service teachers perceived IWBs to be a more useful teaching tool than did university staff; indeed, pre-service teachers were more positive overall in their responses to all eight Likert statements investigating this variable. However, the larger standard deviation for university staff (>1) responses compared to that of pre-service teachers for each of the 8 statements should be noted. Following is an analysis of each of the eight statements investigating participants' Perceived Usefulness of IWBs.

Statement 1: An IWB is a useful teaching tool.

There was a statistically significant difference between the perceptions of pre-service teachers (M=4.55) and university teaching staff (M=1.78) regarding whether they thought an IWB was a useful teaching tool (t=11.458, df=18.604, p=0.000). Pre-service teachers perceived IWBs to be far more useful teaching tool than did university staff.

Statement 2: IWBs are suitable for my intended teaching area.

There was a statistically significant difference between the perceptions of pre-service teachers (M=4.15) and university teaching staff (M=3.50) regarding whether they thought IWBs were suited to their intended teaching area (t=2.548, df=138, p<0.05). Pre-service teachers perceived IWBs to be more suited to their teaching area than did university staff.

Statement 3: It is not difficult to think of ways to use an IWB.

It is not difficult to think of ways to use an IWB. There was a statistically significant difference between the perceptions of pre-service teachers (M=4.02) and university teaching staff (M=3.33) regarding whether they thought it was not difficult to think of ways to use an IWB (t=2.926, df=138, p<0.05). On average, pre-service teachers perceived themselves to have less difficulty in thinking of ways to use IWBs than did university staff.

Statement 4: Using an IWB as a teaching tool will make me a better teacher.

No statistical significance was evident. A large standard deviation was present in university teaching staff results (1.425), suggesting that there was a divergent range of responses to this item.

Statement 5: Using an IWB will improve my teaching.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.72) and university teaching staff (M=2.56) regarding whether they thought that using an IWB would improve their teaching (t=3.389, df=18.767, p<0.05). On average, pre-service teachers were more inclined to think that using an IWB would improve their teaching than were university teaching staff.

Statement 6: Knowing how to use an IWB will assist my career.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.91) and university teaching staff (M=2.94) regarding whether they thought that knowing how to use an IWB would assist their career (t=2.435, df=19.454, p<0.05). On average, pre-service teachers were more likely to think that using an IWB would assist their career than were university teaching staff.

Statement 7: IWBs are not just a passing fad.

There was a statistically significant difference between the perceptions of pre-service teachers (M=4.22) and university staff (M=3.33) regarding whether they thought that IWBs were not just a passing fad (t=2.542, df=18.293, p<0.05). On average, pre-service teachers were more inclined to think that IWB were not just a passing fad than were university teaching staff.

Statement 8: IWBs make it easier to re-cap teaching points.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.96) and university staff (M=2.11) regarding whether they thought IWBs made it easier to re-cap on teaching points (t=8.573, df=138, p=0.000). Pre-service teachers thought IWBs made it easier to re-cap on teaching points than did university staff.

Table 4.5.1-2 is a compilation of the pre-service teachers and university staff members' responses to the eight Likert statements that investigated the first variable, Perceived Usefulness of IWBs. It includes both the number and percentage of responses according to whether the respondent selected Strongly Agree (SA), Agree, (A), Unsure (U), Disagree (D), or Strongly Disagree (SA) for each statement.

Of particular note was that on average, university staff (*M*=1.78) did not perceive IWBs to be a useful teaching tool, nor did they think that knowing how to use an IWB would help assist their careers (*M*=2.56), whereas pre-service teachers did (*M*=4.55, 3.72). As can be seen in Table 4.5.1-2, only 1 (6%) university staff member viewed an IWB as a useful teaching tool whilst 13 (81%) did not, compared with 97% (118) pre-service teachers who did and 0 (0%) who did not. Over 100 (82%) pre-service teachers strongly agreed/agreed that IWBs were suitable for their intended teaching area, with only six (4%) strongly disagreeing/disagreeing. In comparison, only two (13%) university staff thought IWBs were suitable for their intended teaching area, whilst the majority (13, 81%) considered them unsuitable.

The data in Table 4.5.1-1 indicate that pre-service teachers found it easier to think of ways to use an IWB than did university staff (*M*=4.02, 3.33). In fact, 98 (80%) pre-service teachers strongly agreed/agreed that it was easy to find ways to use an IWB compared to 4 (25%) university staff (Table 4.5.1-2); twelve (75%) university staff did not think it was easy to find ways to use an IWB compared with only 6 (5%) of pre-service teachers. Seventy-seven (64%) pre-service teachers strongly agreed/ agreed that using an IWB would improve their teaching compared to five (32%) university staff (Table 4.5.1-2). Nearly three-quarters of (86, 71%) the pre-service teacher participants strongly agreed/agreed that knowing how to use an IWB would assist their teaching career compared to 5 (32%) university staff; further to this, 10 (63%) university staff strongly disagreed/disagreed.

Table 4.5.1-2

Perceptions of Pre-Service Teachers and UTAS Teaching Staff Regarding Perceived Usefulness of IWBs

		Pre-Service Teachers					UTAS Staff				
Item No.	Item Statement	SA no (%)	A no (%)	U no (%)	D no (%)	SD no (%)	SA no (%)	A no (%)	U no (%)	D no (%)	SD no (%)
1.	An IWB is a useful teaching tool	71 (58%)	47 (39%)	4 (3%)	0 (0%)	0 (0%)	0 (0%)	1 (6%)	2 (13%)	9 (56%)	4 (25%)
2.	IWBs are suitable for my intended teaching area	48 (39%)	53 (43%)	14 (11%)	3 (2%)	3 (2%)	0 (0%)	2 (13%)	1 (6%)	9 (56%)	4 (25%)
3.	It is not difficult to think of ways to use an IWB	34 (28%)	64 (52%)	18 (15%)	4 (3%)	2 (2%)	0 (0%)	1 (6%)	3 (19%)	11 (69%)	1 (6%)
4.	Using an IWB as a teaching tool will make me a better teacher	20 (16%)	45 (36%)	35 (29%)	19 (16%)	3 (2%)	0 (0%)	2 (13%)	5 (31%)	7 (44%)	2 (13%)
5.	Using an IWB will improve my teaching	19 (16%)	58 (48%)	40 (33%)	2 (2%)	3 (2%)	2 (13%)	3 (19%)	2 (13%)	5 (31%)	6 (38%)
6.	Knowing how to use an IWB will assist my career	30 (25%)	56 (46%)	13 (11%)	5 (4%)	9 (7%)	2 (13%)	3 (19%)	1 (6%)	8 (50%)	2 (13%)
7.	IWBs are not just a passing fad	46 (38%)	60 (49%)	13 (11%)	3 (2%)	0 (0%)	0 (0%)	1 (6%)	5 (31%)	7 (44%)	3 (19%)
8.	IWBs make it easier to re-cap teaching points	30 (25%)	63 (52%)	24 (20%)	4 (3%)	1 (1%)	0 (0%)	2 (13%)	4 (25%)	8 (50%)	2 (13%)

The two primary school teachers' survey responses to the eight Likert statements that investigated the first variable, Perceived Usefulness of IWBs, are presented in Table 4.5.1-3; participants selected either Strongly Agree (SA), Agree, (A), Unsure (U), Disagree (D), or Strongly Disagree (SA) for each statement. Overall, the responses of the primary school teachers, Diane and Jane, indicated that they perceived IWBs to be useful. Diane was particularly positive in her perception of the usefulness of IWBs regarding all eight aspects investigated; whilst Jane was positive overall, she found it difficult to find ways to use an IWB and she did not think that using an IWB would make her a better teacher.

Table 4.5.1-3

Perceptions of Primary School Teachers Regarding Usefulness of IWBs

Item No.	Item Statement	Jane	Diane
1.	An IWB is a useful teaching tool	A	SA
2.	IWBs are suitable for my intended teaching area	A	SA
3.	It is not difficult to think of ways to use an IWB	D	SA
4.	Using an IWB as a teaching tool will make me a better teacher	D	SA
5.	Using an IWB will improve my teaching	A	SA
6.	Knowing how to use an IWB will assist my career	A	SA
7.	IWBs are not just a passing fad	A	SA
8.	IWBs make it easier to re-cap teaching points	A	SA

4.5.2 Analysis of Responses to Likert Statements Investigating Participants' Attitude towards IWB use

The eight Likert statements that investigated the second potentially influential variable, participants' Attitude towards IWB use, are shown in Table 4.5.2-1. The table includes the mean, standard deviation, *t*-values, degrees of freedom, and significance (2-tailed) value gained from independent *t*-tests of the responses of both pre-service teachers and university staff.

Table 4.5.2-1

Participants' Attitude towards IWB Use

Item No.	Item Statement	Pre-Service Teachers Mean	Pre-Service Teachers Std. Dev.	UTAS Staff Mean	UTAS Staff Std. Dev.	*t*	*df*	Sig. (2-tailed) *p*
1.	There are not better teaching tools than IWBs	3.05	0.714	2.22	1.114	3.057	19.113	.006**
2.	I like using IWBs	3.93	0.752	2.44	1.247	4.911	18.862	.000**
3.	I favour using IWBs in my teaching	3.80	0.840	2.83	1.465	2.743	18.680	.013*
4.	IWBs are an important teaching tool	3.98	0.733	2.06	0.998	9.872	138.000	.000**
5.	IWBs are of interest to me	4.30	0.689	3.50	1.543	2.154	18.011	.045*
6.	It is important to utilise an IWB in my teaching	3.89	0.769	2.44	1.294	4.633	18.814	.000**
7.	Good IWB skills are an important component of teaching	3.78	0.886	2.39	1.378	4.154	19.128	.001**
8.	My teaching will appear more up to date if I use an IWB	3.84	0.793	2.44	1.338	4.327	18.799	.000**

* $p<0.05$.

** $p<0.01$.

As shown in Table 4.5.2-1, there were statistically significant differences found for all eight statements. Overall, these results indicate that pre-service teachers were more positive regarding their Attitude towards IWB use than were university staff participants, although the standard deviation was notably greater for university staff than their counterparts for each of the eight Likert statements investigating this variable. Following is an analysis of each of the eight statements investigating participants' Attitude towards IWB use.

Statement 1: There are not better teaching tools than IWBs.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.05) and university staff (M=2.22) regarding whether there were not better teaching tools than IWBs (t=3.057, df=19.113, p<0.05), with pre-service teachers more inclined to agree that were not better teaching tools than IWBs than were university staff.

Statement 2: I like using IWBs.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.93) and university staff (M=2.44) regarding whether they liked used IWBs (t=4.911, df=18.862, p=0.000). Pre-service teachers were more inclined to like using an IWB than were university staff.

Statement 3: I favour using IWBs in my teaching.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.80) and university staff (M=2.83) regarding whether participants favoured using IWBs in their teaching (t=2.743, df=18.680, p<0.05), with pre-service teachers more likely to favour using an IWB than were university staff.

Statement 4: IWBs are an important teaching tool.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.98) and university staff (M=2.06) regarding whether they considered IWBs to be an important teaching tool (t=9.872, df=138, p=0.000). On average, pre-service teachers perceived IWBs to be a more important teaching tool than did university staff.

Statement 5: IWBs are of interest to me.

There was a statistically significant difference between the perceptions of pre-service teachers (M=4.30) and university staff (M=3.50) regarding whether IWBs were of interest to them (t=2.154, df=18.011, p<0.05). On average, IWBs were of greater interest to pre-service teachers than they were for university staff.

Statement 6: It is important to utilise an IWB in my teaching.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.93) and university staff (M=2.44) regarding whether they thought it was important to use an IWB in their teaching (t=4.633, df=18.814, (p=0.000). Pre-service teachers thought using an IWB in their teaching was more important than did university staff.

Statement 7: Good IWB skills are an important component of teaching.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.78) and university staff (M=2.39) regarding whether good IWB skills were an important component of teaching (t=4.154, df=19.128, p<0.05). Pre-service teachers perceived good IWBs skills to be a more important component of teaching than did university staff.

Statement 8: My teaching will appear more up to date if I use an IWB.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.84) and university staff (M=2.44) regarding whether they thought their teaching would appear more up to date if they used an IWB (t=4.327, df=18.799, (p=0.000). Pre-service teachers tended to agree that their teaching would appear more up to date by using an IWB than did university staff

Table 4.5.2-2 is a compilation of the pre-service teachers and university staff members' responses to the eight Likert statements that investigated the second variable, Attitude towards IWB use. It includes both the number and percentage of responses according to whether the respondent selected Strongly Agree (SA), Agree, (A), Unsure (U), Disagree (D), or Strongly Disagree (SA) for each statement.

The data in Table 4.5.2-2 indicate that 110 (90%) pre-service teachers and 13 (81%) university staff strongly agreed/agreed that IWBs were of interest to them. The majority of pre-service teachers (89, 74%) and university staff 13 (81%) participants strongly agreed/agreed that IWBs were an important teaching tool. Eighty nine (73%) pre-service teachers strongly agreed/agreed that good IWB skills were an important component of teaching, as did 9 (47%) university staff. Only 87 (71%) UTAS staff and five (32%) pre-service teacher participants indicated that they liked using an IWB, however a further 33 (27%) pre-service teachers and eight (50%) university staff responded that they were unsure. Furthermore, 30 (25%) pre-service teachers and 3 (19%) university staff were unsure if they favoured using an IWB in their teaching, whilst 83 (68%) pre-service teachers and 7 (44%) university staff strongly agreed/agreed that they did favour using an IWB. Overall, the responses to these eight statements suggest that pre-service teachers tended to have more positive attitudes to IWBs than did university staff.

Table 4.5.2-2

Perceptions of Pre-Service Teachers and UTAS Teaching Staff Regarding Attitude towards IWB Use

		Pre-Service Teachers					UTAS Staff				
Item No.	Item Statement	SA no (%)	A no (%)	U no (%)	D no (%)	SD no (%)	SA no (%)	A no (%)	U no (%)	D no (%)	SD no (%)
1.	There are not better teaching tools than IWBs	0 (0%)	25 (20%)	69 (57%)	25 (20%)	3 (2%)	0 (0%)	1 (6%)	8 (50%)	5 (31%)	2 (13%)
2.	I like using IWBs	28 (23%)	59 (48%)	33 (27%)	2 (2%)	0 (0%)	2 (13%)	3 (19%)	8 (50%)	3 (19%)	0 (0%)
3.	I favour using IWBs in my teaching	24 (20%)	59 (48%)	30 (25%)	9 (7%)	0 (%)	2 (13%)	5 (31%)	3 (19%)	6 (38%)	2 (13%)
4.	IWBs are an important teaching tool	28 (23%)	66 (54%)	25 (20%)	3 (2%)	0 (0%)	0 (0%)	13 (81%)	1 (6%)	2 (13%)	0 (0%)
5.	IWBs are of interest to me	50 (41%)	60 (49%)	10 (8%)	2 (2%)	0 (0%)	4 (25%)	9 (56%)	1 (6%)	2 (13%)	0 (0%)
6.	It is important to utilise an IWB in my teaching	24 (20%)	66 (54%)	28 (23%)	3 (2%)	4 (3%)	1 (6%)	7 (44%)	3 (19%)	5 (31%)	0 (0%)
7.	Good IWB skills are an important component of teaching	21 (17%)	68 (56%)	19 (16%)	13 (11%)	4 (3%)	2 (13%)	7 (44%)	1 (6%)	6 (38%)	0 (0%)
8.	My teaching will appear more up to date if I use an IWB	20 (16%)	72 (59%)	22 (16%)	22 (16%)	7 (6%)	1 (6%)	7 (44%)	4 (25%)	3 (19%)	1 (6%)

The two primary school teachers' survey responses to the eight Likert statements that investigated the second variable, Attitude towards IWB use, are presented in Table 4.5.2-3; participants selected either Strongly Agree (SA), Agree, (A), Unsure (U), Disagree (D), or Strongly Disagree (SA) for each statement. These data show that both Diane and Jane recorded a positive attitude towards virtually all aspects of IWB use being investigated; indeed, there was only one unsure response (3) recorded, that being Jane's response to Likert Statement 1, 'There are not better teaching tools than IWBs'. Of the remaining 7 statements, Diane demonstrated a consistently stronger positive attitude towards IWB use than did Jane in 6 instances, and was equal in agreement with Jane to Likert Statement 3, that they favoured using IWBs in their teaching.

Table 4.5.2-3

Perceptions of Primary School Teachers Regarding Attitude towards IWB Use

Item No.	Item Statement	Jane	Diane
1.	There are not better teaching tools than IWBs	U	A
2.	I like using IWBs	A	SA
3.	I favour using IWBs in my teaching	A	A
4.	IWBs are an important teaching tool	A	SA
5.	IWBs are of interest to me	A	SA
6.	It is important to utilise an IWB in my teaching	A	SA
7.	Good IWB skills are an important component of teaching	A	SA
8.	My teaching will appear more up to date if I use an IWB	A	SA

4.5.3 Analysis of Responses to Likert Statements Investigating Participants' Self-Efficacy in Relation to Using IWBs

The eight Likert statements that investigated the third potentially influential variable, participants' Self-Efficacy in relation to using IWBs, are shown in Table 4.5.3-1. The table includes the mean, standard deviation, *t*-value, degrees of freedom, and significance (2-tailed) value gained from independent *t*-tests of the responses of both pre-service teachers and university staff.

Table 4.5.3-1

Participants' Self-Efficacy with IWBs

Item No.	Item Statement	Pre-Service Teachers Mean	Pre-Service Teachers Std. Dev.	UTAS Staff Mean	UTAS Staff Std. Dev.	*t*	*df*	Sig. (2-tailed) *p*
1.	I believe I have the skills needed for using an IWB effectively	3.31	1.092	2.67	1.414	2.248	138.000	.026*
2.	IWBs do not frustrate me	3.64	0.891	3.17	1.295	1.970	138.000	.051
3.	I could use an IWB if I knew help was available if I had trouble	3.93	0.810	2.33	1.237	5.327	19.212	.000**
4.	I possess adequate IWB skills to teach with one	2.94	1.159	2.67	1.414	0.916	138.000	.361
5.	Using an IWB does not make me nervous and uncomfortable	3.80	0.899	3.33	1.372	1.885	138.000	.062
6.	I am confident I can use an IWB	3.64	0.873	2.22	1.166	6.142	138.000	.000**
7.	I do not dread using an IWB	4.20	0.823	3.44	1.464	2.154	18.615	.045*
8.	I could learn to use an IWB if someone showed me how to do it first	4.20	0.840	4.00	1.085	9.961	138.000	.000**

* $p<0.05$.

** $p<0.01$.

There were statistically significant differences found relating to Statements 1, 3, 6 and 7, 8 regarding the mean analysis of the scores for pre-service teachers and university staff. Overall, the data in Table 4.5.3-1 suggest that the pre-service teachers had greater self-efficacy with IWBs than did university staff. Following is an analysis of each of the eight statements investigating participants' Self-Efficacy with IWBs.

Statement 1: I believe I have the skills needed for using an IWB effectively.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.31) and university staff (M=2.67) regarding whether they thought they had the skills for using an IWB effectively (t=2.248, df=138, p<0.05). Pre-service teachers perceived themselves to be more skilled with using an IWB effectively than did university staff.

Statement 2: IWBs do not frustrate me.

No statistical significance was evident; a notably high standard deviation was present in university staff results (1.295), indicating a divergent range of responses.

Statement 3: I could use an IWB if I knew help was available if I had trouble.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.93) and university staff (M=2.33) regarding whether participants thought they could use an IWB if they knew help was available (t=5.327, df=19.212, p=0.000). On average, pre-service teachers were more inclined to perceive they could use an IWB if they knew help was available than were university staff.

Statement 4: I possess adequate IWB skills to teach with one.

No statistical significance was evident; a notably high standard deviation was present in university staff and pre-service teacher results (1.414 and 1.159 respectively).

Statement 5: Using an IWB does not make me nervous and uncomfortable.

No statistical significance was evident; a notably high standard deviation was present in university staff results (1.166).

Statement 6: I am confident I can use an IWB.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.64) and university staff (M=2.22) regarding their confidence when using an IWB (t=6.142, df=138, p=0.000); pre-service teachers indicated they were more confident when using an IWB than did university staff.

Statement 7: I do not dread using an IWB.

There was a statistically significant difference between the perceptions of pre-service teachers (M=4.20) and university staff (M=3.44) regarding whether they did not dread using an IWB (t=2.154, df=18.615, p<0.05). Pre-service teachers were more inclined to not dread using an IWB than university staff.

Statement 8: I could learn to use an IWB if someone showed me how to do it first.

There was a statistically significant difference between the perceptions of pre-service teachers (M=4.20) and university staff (M=4.00) regarding whether they believed they could learn to use an IWB if someone showed them how to do it first (t=9.961, df=138, p=0.000). Pre-service teachers were slightly more inclined to think that they could learn to use an IWB if someone showed them how to do it first than were university staff.

Table 4.5.3-2 is a compilation of the pre-service teachers and university staff members' responses to the eight Likert statements that investigated the third variable, Self-Efficacy with IWBs. It includes both the number and percentage of responses according to whether the respondent selected Strongly Agree (SA), Agree, (A), Unsure (U), Disagree (D), or Strongly Disagree (SA) for each statement.

Responses to Likert Statement 1, I believe I have the skills needed for using an IWB, indicate that quite close percentages for each response type for the two participant groups; 48% (49) pre-service teachers and 37% (6) university staff strongly agree/agree with this statement, 29% (35) pre-service teachers and 25% (4) university staff are unsure, and 25% (28) pre-service teachers strongly disagree/disagree compared with 37% (6) university staff. However, with over 100 (83%) pre-service teachers responses strongly agreeing/agreeing with Likert Statement 3 (Table 4.5.3-2), I could use an IWB if I knew help was available if I had trouble, compared to just 4 (25%) of university staff, it would seem that pre-service teachers possessed stronger self-efficacy than university staff. This is supported by the responses to Likert Statement 6, I am confident I can use an IWB; overall, 80 (65%) pre-service teachers strongly agreed/agreed with this statement, compared with only 3 (19%) university staff. Furthermore, 14 (12%) pre-service teachers and 10 (62%) university staff strongly disagreed/disagreed with Statement 6.

Table 4.5.3-2

Perceptions of Pre-Service Teachers and UTAS Teaching Staff Regarding Self-Efficacy with IWBs

		Pre-Service Teachers					UTAS Staff				
Item No.	Item Statement	SA no (%)	A no (%)	U no (%)	D no (%)	SD no (%)	SA no (%)	A no (%)	U no (%)	D no (%)	SD no (%)
1.	I believe I have the skills needed for using an IWB effectively	15 (12%)	44 (36%)	35 (29%)	20 (16%)	8 (7%)	1 (6%)	5 (31%)	4 (25%)	5 (31%)	1 (6%)
2.	IWBs do not frustrate me	17 (14%)	60 (49%)	30 (25%)	14 (11%)	1 (1%)	0 (0%)	0 (0%)	8 (50%)	7 (44%)	1 (6%)
3.	I could use an IWB if I knew help was available if I had trouble	23 (19%)	78 (64%)	14 (11%)	4 (3%)	3 (%)	0 (0%)	4 (25%)	3 (19%)	8 (50%)	1 (6%)
4.	I possess adequate IWB skills to teach with one	12 (10%)	36 (30%)	34 (28%)	27 (22%)	13 (11%)	1 (6%)	5 (31%)	4 (25%)	5 (31%)	1 (6%)
5.	Using an IWB does not make me nervous and uncomfortable	25 (20%)	60 (49%)	25 (20%)	11 (9%)	1 (1%)	0 (0%)	1 (6%)	3 (19%)	11 (69%)	1 (6%)
6.	I am confident I can use an IWB	14 (11%)	66 (54%)	28 (23%)	12 (10%)	2 (2%)	0 (%)	3 (19%)	3 (19%)	9 (56%)	1 (6%)
7.	I do not dread using an IWB	49 (40%)	55 (45%)	13 (11%)	4 (3%)	1 (1%)	3 (19%)	9 (56%)	3 (19%)	1 (6%)	0 (0%)
8.	I could learn to use an IWB if someone showed me how to do it first	48 (39%)	58 (48%)	9 (7%)	6 (5%)	1 (1%)	2 (13%)	10 (62%)	2 (13%)	2 (13%)	0 (0%)

The two primary school teachers' survey responses to the eight Likert statements that investigated the third variable, Self-Efficacy with IWBs, are presented in Table 4.5.3-3; participants selected either Strongly Agree (SA), Agree, (A), Unsure (U), Disagree (D), or Strongly Disagree (SA) for each statement. Diane's responses of strongly agree/agree to each of the eight statements investigating this potentially influential variable demonstrated her strong self-efficacy with using IWBs. Jane agreed that she believed she had the skills needed to use an IWB effectively; however, her responses to Statements 6 and 7 indicated that she was not confident that she could use an IWB, and that she dreaded using an IWB. Because the statements investigating this aspect of IWB self-efficacy were presented in different ways (Statement 6 framed in a positive manner and Statement 7 in a negative manner), it appears that this finding is accurate despite the small size of the data set.

Table 4.5.3-3

Perceptions of Primary School Teachers Regarding Self-Efficacy with IWBs

Item No.	Item Statement	Jane	Diane
1.	I believe I have the skills needed for using an IWB effectively	A	A
2.	IWBs do not frustrate me	A	A
3.	I could use an IWB if I knew help was available if I had trouble	D	A
4.	I possess adequate IWB skills to teach with one	D	SA
5.	Using an IWB does not make me nervous and uncomfortable	A	SA
6.	I am confident I can use an IWB	D	SA
7.	I do not dread using an IWB	D	SA
8.	I could learn to use an IWB if someone showed me how to do it first	D	A

4.5.4 Analysis of Responses to Likert Statements Investigating Participants' Perceived Ease of Use of IWBs

The eight Likert statements that investigated the fourth potentially influential variable, Perceived Ease of Use of IWBs, are shown in Table 4.5.4-1. The table includes the mean, standard deviation, *t*-value, degrees of freedom, and significance (2-tailed) value gained from independent *t*-tests of the responses of both pre-service teachers and university staff.

Table 4.5.4-1

Participants' Perceived Ease of Use of IWBs

Item No.	Item Statement	Pre-Service Teachers Mean	Pre-Service Teachers Std. Dev.	UTAS Staff Mean	UTAS Staff Std. Dev.	*t*	*df*	Sig. (2-tailed) *p*
1.	IWBs are easy to use	3.55	0.785	2.39	1.037	5.621	137.000	.000**
2.	IWBs make it easier to improvise lessons	3.58	0.834	2.78	1.263	3.527	137.000	.001**
3.	IWBs are worth the effort needed to use them	4.06	0.662	3.11	1.410	2.804	18.131	.012*
4.	I will be more organised if I use an IWB	3.19	0.897	3.22	1.353	-0.132	137.000	.895
5.	IWBs are not difficult to use	3.70	0.823	3.17	1.383	1.602	18.832	.126
6.	IWBs are not too hard to bother with	4.01	0.713	3.33	1.414	1.988	18.306	.062
7.	IWBs are simple and unchallenging	2.95	0.884	2.67	1.237	1.202	137.000	.232
8.	Lessons involving IWBs do not take longer to prepare	3.31	0.773	2.67	1.085	3.093	137.000	.002**

* $p<0.05$.

** $p<0.01$.

As shown in Table 4.5.4-1, there was statistically significant difference found for Statements 1, 2, 3 and 8 regarding the mean analysis of the scores for pre-service teachers and university teaching staff. These data suggest that pre-service teachers perceived greater ease of use of IWBs than did university staff. Following is an analysis of each of the eight statements investigating participants' Perceived Ease of Use of IWBs.

Statement 1: IWBs are easy to use.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.55) and university staff (M=2.39) regarding whether IWBs were easy to use (t=5.621, df=137, p=0.000), with pre-service teachers perceiving IWBs to be easier to use than did university staff.

Statement 2: IWBs make it easier to improvise lessons.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.58) and university staff (M=2.78) regarding whether IWBs made it easier to improvise lessons (t=3.527, df=137, p<0.05). Pre-service teachers were more inclined to think IWBs made it easier to improve lessons than were university staff.

Statement 3: IWBs are worth the effort needed to use them.

There was a statistically significant difference between the perceptions of pre-service teachers (M=4.06) and university staff (M=3.11) regarding whether IWBs were worth the effort needed to use them (t=2.804, df=18.131, p<0.05). Pre-service teachers were more inclined to think that IWBs were worth the effort needed to use them than were university staff.

Statement 4: I will be more organised if I use an IWB.

No statistical significance was evident; a notably high standard deviation was present in university staff results (1.353).

Statement 5: IWBs are not difficult to use.

No statistical significance was evident; a notably high standard deviation was present in university staff results (1.383).

Statement 6: IWBs are not too hard to bother with.

No statistical significance was evident; a notably high standard deviation was present in university staff results (1.414).

Statement 7: IWBs are simple and unchallenging.

No statistical significance was evident; a notably high standard deviation was present in university staff results (1.237).

Statement 8: Lessons involving IWBs do not take longer to prepare.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.31) and university staff (M=2.67) regarding whether lessons involving IWBs did not take longer to prepare (t=3.093, df=137, p<0.05). Pre-service teachers were more inclined to perceive that lessons involving IWBs did not take longer to prepare than were university staff.

Table 4.5.4-2 is a compilation of the pre-service teachers and university staff members' responses to the eight Likert statements that investigated the fourth variable, Perceived Ease of Use of IWBs. It includes both the number and percentage of responses according to whether the respondent selected Strongly Agree (SA), Agree, (A), Unsure (U), Disagree (D), or Strongly Disagree (SA) for each statement.

Almost two-thirds (64%) of the pre-service teachers strongly agreed/agreed that IWBs were easy to use (Statement 1), compared with only six (38%) university staff (Table 4.5.4-2); a notably large percentage of both of these participant groups, 40% (49) and 56% (9) respectively, indicated that they were unsure. Similar rates of assent were recorded for Likert Statement 2 investigating whether participants thought IWBs made it easier to improvise lessons (see Table 4.5.4-2). Of particular note is the responses to Statement 3, IWBs are worth the effort needed to use them; 99 (83%) pre-service teachers strongly agreed/agreed, compared to only 2 (13%) university staff. Eight (13%) university staff strongly disagreed/disagreed with this statement compared with only 1 (1%) pre-service teacher.

Table 4.5.4-2

Perceptions of Pre-Service Teachers and UTAS Teaching Staff Regarding Perceived Ease of Use of IWBs

		Pre-Service Teachers					UTAS Staff				
Item No.	Item Statement	SA no (%)	A no (%)	U no (%)	D no (%)	SD no (%)	SA no (%)	A no (%)	U no (%)	D no (%)	SD no (%)
1.	IWBs are easy to use	12 (10%)	52 (43%)	49 (40%)	7 (6%)	1 (1%)	0 (0%)	6 (38%)	9 (56%)	1 (6%)	0 (0%)
2.	IWBs make it easier to improvise lessons	16 (13%)	49 (40%)	45 (37%)	11 (9%)	0 (0%)	1 (6%)	1 (6%)	9 (56%)	5 (31%)	0 (0%)
3.	IWBs are worth the effort needed to use them	29 (24%)	70 (58%)	20 (17%)	1 (1%)	0 (0%)	0 (0%)	2 (13%)	6 (38%)	6 (38%)	2 (13%)
4.	I will be more organised if I use an IWB	10 (8%)	31 (26%)	53 (44%)	26 (21%)	1 (1%)	0 (0%)	1 (6%)	5 (31%)	9 (56%)	1 (6%)
5.	IWBs are not difficult to use	22 (18%)	52 (43%)	43 (36%)	5 (4%)	1 (1%)	2 (13%)	6 (38%)	7 (44%)	1 (6%)	0 (0%)
6.	IWBs are not too hard to bother with	28 (23%)	69 (57%)	20 (17%)	3 (2%)	1 (1%)	0 (0%)	1 (6%)	4 (25%)	9 (56%)	2 (13%)
7.	IWBs are simple and unchallenging	4 (3%)	27 (22%)	54 (45%)	31 (26%)	5 (4%)	0 (0%)	4 (25%)	9 (56%)	2 (13%)	1 (6%)
8.	Lessons involving IWBs do not take longer to prepare	8 (7%)	35 (29%)	65 (54%)	12 (10%)	1 (1%)	0 (0%)	2 (13%)	12 (75%)	2 (13%)	0 (0%)

The two primary school teachers' survey responses to the eight Likert statements that investigated the fourth variable, Perceived Ease of Use of IWBs, are presented in Table 4.5.4-3; participants selected either Strongly Agree (SA), Agree, (A), Unsure (U), Disagree (D), or Strongly Disagree (SA) for each statement. Whilst both Diane and Jane agreed that IWBs were easy to use, it is evident from Table 4.5.4-3 that overall, Diane perceived greater ease of use of IWBs than did Jane. Jane was unsure whether IWBs were worth the effort needed to use them, she disagreed that IWBs were not too hard to bother with, and was unsure whether lessons involving IWBs took longer to plan or not. In contrast, Diane strongly agreed with four of the statements, notably Statement 3, that IWBs are worth the effort needed to use them.

Table 4.5.4-3

Perceptions of Primary School Teachers Regarding Perceived Ease of Use of IWBs

Item No.	Item Statement	Jane	Diane
1.	IWBs are easy to use	D	A
2.	IWBs make it easier to improvise lessons	A	A
3.	IWBs are worth the effort needed to use them	U	SA
4.	I will be more organised if I use an IWB	A	A
5.	IWBs are not difficult to use	A	SA
6.	IWBs are not too hard to bother with	D	SA
7.	IWBs are simple and unchallenging	A	SA
8.	Lessons involving IWBs do not take longer to prepare	U	A

4.5.5 Analysis of Responses to Likert Statements Investigating Participants' Perceptions of the Technological Complexity of IWBs

The eight Likert statements that investigated the fifth potentially influential variable, perceptions of the Technological Complexity of IWBs, are shown in Table 4.5.5-1. The table includes the mean, standard deviation, *t*-value, degrees of freedom, and significance (2-tailed) value gained from independent *t*-tests of the responses of both pre-service teachers and university staff.

Table 4.5.5-1

Participants' Perceptions of the Technological Complexity of IWBs

Item No.	Item Statement	Pre-Service Teachers Mean	Pre-Service Teachers Std. Dev.	UTAS Staff Mean	UTAS Staff Std. Dev.	*t*	*df*	Sig. (2-tailed) *p*
1.	I think I am good at using an IWB	3.25	0.866	2.56	1.504	1.918	18.740	.071
2.	Trouble-shooting IWB issues is not difficult	2.97	0.670	2.67	1.414	0.909	18.170	.375
3.	I find problem-solving IWB issues easy	2.99	0.631	2.61	1.501	1.062	17.920	.302
4.	IWBs are not too complex to use	3.71	0.705	2.89	1.530	2.230	18.180	.039*
5.	I think I am good at using an IWB	3.45	0.861	2.61	1.461	2.385	18.826	.028*
6.	I do not struggle to use an IWB well	3.33	0.865	2.72	1.526	1.644	18.684	.117
7.	It does not take too long to learn how to use an IWB	3.72	0.712	2.83	1.465	2.530	18.233	.021*
8.	Using an IWB does not take too much planning time	3.60	0.705	2.72	1.364	2.667	18.398	.016*

* $p<0.05$.

As shown in Table 4.5.5-1, there were statistically significant differences found relating to Statements 4, 5, 7 and 8 regarding the mean analysis of the scores for pre-service teachers and university teaching staff. It is evident from the pre-service teachers' higher mean score value compared to that of university staff for all statements for which there was a significant difference that university staff perceived IWBs to be more technologically complex than did university staff. Following is an analysis of each of the eight statements investigating participants' perceptions of the Technological Complexity of IWBs.

Statement 1: I think I am good at using an IWB.

No statistical significance was evident; a notably high standard deviation was present in university staff results (1.504); this indicates a divergent range of responses.

Statement 2: Trouble-shooting IWB issues is not difficult.

No statistical significance was evident; a notably high standard deviation was present in university staff results (1.414), suggesting that there was a divergent range of responses to this item.

Statement 3: I find problem-solving IWB issues easy.

No statistical significance was evident; a notably high standard deviation was present in university staff results (1.501), suggesting that there was a divergent range of responses to this item.

Statement 4: IWBs are not too complex to use.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.71) and university staff (M=2.89) regarding whether IWBs were not too complex to use (t=2.230, df=18.180, p<0.05). University staff were more likely than pre-service teachers to perceive IWBs as too complex to use.

Statement 5: I think I am good at using an IWB.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.45) and university staff (M=2.61) regarding whether they thought they were good at using an IWB (t=2.385, df=18.826, p<0.05). Pre-service teachers had higher perceptions of how good they were at using an IWB compared to the perceptions of university staff.

Statement 6: I do not struggle to use an IWB well. No statistical significance was evident; a notably high standard deviation was present in university staff results (1.526), suggesting that there was a divergent range of responses to this item.

Statement 7: It does not take too long to learn how to use an IWB.
There was a statistically significant difference between the perceptions of pre-service teachers (M=3.72) and university staff (M=2.83) regarding the statement, 'It does not take too long to learn to use an IWB' (t=2.530, df=18.233, p<0.05). These results indicate that university staff participants were more inclined to think it took too long to learn to use an IWB than were pre-service teachers.

Statement 8: Using an IWB does not take too much planning time.
There was a statistically significant difference between the perceptions of pre-service teachers (M=3.60) and university staff (M=2.72) regarding whether using an IWB does not take too much planning time (t=2.667, df=18.398, p<0.05). University staff were more inclined to think that using an IWB would take too much planning time than were pre-service teachers.

Table 4.5.5-2 is a compilation of the pre-service teachers and university staff members' responses to the eight Likert statements that investigated the fifth variable, Technological Complexity of IWBs. It includes both the number and percentage of responses according to whether the respondent selected Strongly Agree (SA), Agree, (A), Unsure (U), Disagree (D), or Strongly Disagree (SA) for each statement.

There was a notably high number of unsure responses to all eight Likert statements in Table 4.5.5-2 for pre-service teachers and university staff; the minimum percentage overall was 34% (Statement 4, pre-service teachers) and the maximum was 71% (Statement 3, pre-service teachers). This indicates a lack of experience with IWBs for these participants. Despite the high number of unsure responses, 75 (63%) pre-service teachers and six (30%) university staff strongly agreed/agreed that IWBs were not too complex to use, and 70 (59%) pre-service teachers and six (40%) university staff strongly agreed/agreed that it did not take too long to learn how to use an IWB. Nine pre-service teachers (8%) and two (14%) university staff strongly disagreed/ disagreed that they thought they were good at using an IWB. Three (3%) pre-service teachers and four (27%) university staff members indicated that they thought using an IWB took too much planning time, and that it took too long to learn to use an IWB.

Table 4.5.5-2

Perceptions of Pre-Service Teachers and UTAS Teaching Staff Regarding the Technological Complexity of IWBs

		Pre-Service Teachers					UTAS Staff				
Item No.	Item Statement	SA no (%)	A no (%)	U no (%)	D no (%)	SD no (%)	SA no (%)	A no (%)	U no (%)	D no (%)	SD no (%)
1.	I think I am good at using an IWB	7 (6%)	37 (31%)	59 (50%)	11 (9%)	5 (4%)	1 (7%)	3 (20%)	6 (40%)	4 (27%)	1 (7%)
2.	Trouble-shooting IWB issues is not difficult	3 (3%)	17 (14%)	81 (68%)	16 (13%)	2 (2%)	0 (0%)	2 (13%)	10 (67%)	4 (27%)	2 (13%)
3.	I find problem-solving IWB issues easy	2 (2%)	15 (13%)	84 (71%)	16 (13%)	2 (2%)	1 (7%)	2 (13%)	7 (47%)	4 (27%)	1 (7%)
4.	IWBs are not too complex to use	13 (11%)	62 (52%)	40 (34%)	4 (3%)	0 (0%)	2 (13%)	4 (27%)	8 (53%)	1 (7%)	0 (0%)
5.	I think I am good at using an IWB	13 (11%)	41 (34%)	55 (46%)	6 (5%)	3 (3%)	1 (7%)	3 (20%)	9 (60%)	1 (7%)	1 (7%)
6.	I do not struggle to use an IWB well	11 (9%)	34 (29%)	60 (50%)	11 (9%)	3 (3%)	1 (7%)	5 (33%)	7 (47%)	1 (7%)	1 (7%)
7.	It does not take too long to learn how to use an IWB	17 (14%)	53 (45%)	48 (40%)	1 (1%)	0 (0%)	1 (7%)	5 (33%)	8 (53%)	1 (7%)	3 (20%)
8.	Using an IWB does not take too much planning time	12 (10%)	50 (42%)	54 (45%)	3 (3%)	0 (0%)	0 (0%)	5 (33%)	9 (60%)	1 (7%)	3 (20%)

The two primary school teachers' survey responses to the eight Likert statements that investigated the fifth variable, Technological Complexity of IWBs, are presented in Table 4.5.5-3; participants selected either Strongly Agree (SA), Agree, (A), Unsure (U), Disagree (D), or Strongly Disagree (SA) for each statement. Overall, Jane perceived IWBs to be more technologically complex than did Diane. Whilst both Jane and Diane agreed that they were good at using an IWB and that it did not take too long to learn how to use an IWB, Jane's responses also indicated that she found it difficult to trouble-shoot IWB issues, and that she perceived IWBs to be too complex to use. In comparison, Diane strongly agreed that trouble-shooting IWBs was not difficult; she also strongly agreed that she found problem-solving IWBs issues easy and that IWBs were not too complex to use.

Table 4.5.5-3

Perceptions of Primary School Teachers' Regarding the Technological Complexity of IWBs

Item No.	Item Statement	Jane	Diane
1.	I think I am good at using an IWB	A	A
2.	Trouble-shooting IWB issues is not difficult	D	SA
3.	I find problem-solving IWB issues easy	A	SA
4.	IWBs are not too complex to use	D	SA
5.	I think I am good at using an IWB	A	A
6.	I do not struggle to use an IWB well	A	A
7.	It does not take too long to learn how to use an IWB	A	A
8.	Using an IWB does not take too much planning time	A	A

4.5.6 Analysis of Responses to Likert Statements Investigating the Facilitating Conditions for using IWBs Experienced by Participants

The eight Likert statements that investigated the sixth potentially influential variable, Facilitating Conditions for using IWBS, are shown in Table 4.5.6-1. The table includes the mean, standard deviation, *t*-value, degrees of freedom, and significance (2-tailed) value gained from independent *t*-tests of the responses of both pre-service teachers and university staff.

Table 4.5.6-1

Participants' Facilitating Conditions for Using IWBs

Item No.	Item Statement	Pre-Service Teachers Mean	Pre-Service Teachers Std. Dev.	UTAS Staff Mean	UTAS Staff Std. Dev.	*t*	*df*	Sig. (2-tailed) *p*
1.	Support is readily available for using IWBs	3.15	0.744	2.94	1.662	0.520	18.043	.609
2.	The IWB software suits my intended teaching area	3.54	0.711	2.67	1.495	2.431	18.178	.026*
3.	IWBs are reliable and do not tend to break down	3.26	0.719	2.61	1.290	2.088	18.628	.051
4.	There is always an IWB available for me to use	2.75	0.846	3.22	1.629	-1.211	18.411	.241
5.	I am encouraged to use an IWB	3.18	1.102	3.11	1.676	0.160	19.283	.874
6.	There are useful peripheral items I can use in conjunction with an IWB	3.51	0.675	2.61	1.378	2.727	18.252	.014*
7.	I have seen how staff members use IWBs	2.31	1.103	3.22	1.768	-2.126	19.051	.047*
8.	I have time to learn how to use an IWB	3.47	1.080	2.39	1.720	2.592	19.079	.018*

* $p<0.05$.

As shown in Table 4.5.6-1, there were statistically significant differences found in relation to Statements 2, 6, 7 and 8 regarding the mean analysis of the scores for pre-service teachers. Overall, the mean scores for the eight Likert statements investigating the Facilitating Conditions for using IWBs experienced by pre-service teachers and university staff were particularly low, suggesting that there was ample room for improvement. Following is an analysis of each of the eight statements investigating Facilitating Conditions.

Statement 1: Support is readily available for using IWBs.

No statistical significance was evident.

Statement 2: The IWB software suits my intended teaching area.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.54) and university staff (M=2.67) regarding whether IWB software suited their intended teaching area (t=2.431, df= 18.178, p<0.05). These results indicate that pre-service teachers on average perceived the IWB software to be more suited to their intended teaching area than did university staff.

Statement 3: IWBs are reliable and do not tend to break down.

No statistical significance was evident.

Statement 4: There is always an IWB available for me to use.

No statistical significance was evident.

Statement 5: I am encouraged to use an IWB.

No statistical significance was evident.

Statement 6: There are useful peripheral items I can use in conjunction with an IWB.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.51) and university staff (M=2.61) regarding whether there were peripheral items available to use with IWBs (t=2.727, df= 18.252, p<0.05). Pre-

service teachers were more aware of/had greater access to peripheral items to use in conjunction with an IWB than university staff.

Statement 7: I have seen how staff members use IWBs.

There was a statistically significant difference between the perceptions of pre-service teachers (M=2.31) and university staff (M=3.22) regarding whether they had seen how staff members use an IWB (t=-2.126, df= 19.051, p<0.05); university staff were more likely to have seen how staff members used an IWB than were pre-service teachers.

Statement 8: I have time to learn how to use an IWB.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.47) and university staff (M=2.39) regarding whether they perceived they had time to learn to use an IWB (t=2.592, df= 19.079, p<0.05). Pre-service teachers were more inclined to think they had time available to learn to use an IWB than were university staff.

Table 4.5.6-2 is a compilation of the pre-service teachers and university staff members' responses to the eight Likert statements that investigated the sixth variable, Facilitating Conditions for using IWBs. It includes both the number and percentage of responses according to whether the respondent selected Strongly Agree (SA), Agree, (A), Unsure (U), Disagree (D), or Strongly Disagree (SA) for each statement.

Although no statistically significant differences were found between responses to Statement 1 (see Table 4.5.6-1), there was a notable percent of university staff and pre-service teachers (7, 47% and 69, 58% respectively) who indicated they were unsure if support was readily available for using IWBs. In fact, a notably high percent of responses of 'Unsure' were given by pre-service teachers for all eight statements investigating Facilitating Conditions, as well as for Statements 2, 3, 4 and 6 for university staff.

Fifty eight (48%) pre-service teachers strongly agree/agreed that IWB software suited their intended teaching area compared with only two (14%) university staff. None of the university staff had access to an IWB at all times, although five (33%) were unsure and 13 (87%) had no access at all. Nineteen (16%) pre-service teachers

strongly agreed/agreed they had access to an IWB, 41 (28%) were uncertain, and 45 (39%) indicated they did not have IWB access. Only three (17%) university staff members strongly agreed/agreed that they were encouraged to use an IWB whereas 15 (83%) indicated that they were not encouraged. In comparison, 47 (40%) pre-service teachers reported that they were encouraged to use an IWB, 41 (34%) were unsure, and 30 (25%) did not feel that he/she had received encouragement. Only two (13%) university staff members were aware of peripheral items that they could use in conjunction with an IWB compared to 51 (43%) pre-service teachers. A further 78 (66%) pre-service teachers and 10 (67%) university staff members indicated that they were unsure.

Eighteen percent of (21) pre-service teachers and 20% (3) of university staff members strongly agreed/agreed that they had seen university staff using an IWB. The remaining 80% (15) of university staff had not seen other university staff using an IWB, nor had 70 (59%) of pre-service teachers; the remaining 23% (27) pre-service teachers responded unsure. Approximately half of pre-service teachers (69, 58%) and university staff (8, 53%) believed they had enough time to learn how to use an IWB. The remaining university staff members (7, 46%) did not believe they had enough time, as did 19 (16%) pre-service teachers, with the remainder of the pre-service teachers responding unsure (30, 25%).

Table 4.5.6-2

Perceptions of Pre-Service Teachers and UTAS Teaching Staff Regarding the Facilitating Conditions for Using IWBs

		Pre-Service Teachers					UTAS Staff				
		SA	A	U	D	SD	SA	A	U	D	SD
Item No.	Item Statement	no (%)	no (%)	no (%)	no (%)	no (%)	no (%)	no (%)	no (%)	no (%)	no (%)
1.	Support is readily available for using IWBs	2 (2%)	16 (13%)	69 (58%)	27 (23%)	5 (4%)	1 (7%)	0 (0%)	7 (47%)	4 (27%)	3 (20%)
2.	The IWB software suits my intended teaching area	10 (8%)	48 (40%)	58 (49%)	2 (2%)	1 (1%)	1 (7%)	1 (7%)	8 (53%)	4 (27%)	1 (7%)
3.	IWBs are reliable and do not tend to break down	1 (1%)	9 (8%)	74 (62%)	28 (35%)	7 (6%)	0 (0%)	1 (7%)	11 (73%)	3 (20%)	0 (0%)
4.	There is always an IWB available for me to use	3 (3%)	16 (13%)	54 (45%)	40 (34%)	5 (4%)	0 (0%)	0 (0%)	5 (33%)	10 (67%)	3 (20%)
5.	I am encouraged to use an IWB	14 (12%)	33 (28%)	41 (34%)	22 (18%)	8 (7%)	0 (0%)	3 (20%)	0 (0%)	13 (72%)	2 (13%)
6.	There are useful peripheral items I can use in conjunction with an IWB	11 (9%)	40 (34%)	78 (66%)	1 (1%)	0 (0%)	0 (0%)	2 (13%)	10 (67%)	2 (13%)	1 (7%)
7.	I have seen how staff members use IWBs	2 (2%)	19 (16%)	27 (23%)	37 (31%)	33 (28%)	0 (0%)	3 (20%)	0 (0%)	8 (53%)	4 (27%)
8.	I have time to learn how to use an IWB	16 (13%)	53 (45%)	30 (25%)	11 (9%)	8 (7%)	3 (20%)	5 (33%)	0 (0%)	5 (33%)	2 (13%)

The two primary school teachers' survey responses to the eight Likert statements that investigated the sixth variable, Facilitating Conditions for using IWBs, are presented in Table 4.5.6-3; participants selected either Strongly Agree (SA), Agree, (A), Unsure (U), Disagree (D), or Strongly Disagree (SA) for each statement. Overall, Diane's responses indicated that she perceived the facilitating conditions surrounding her use of IWBs at Sandown Primary School to be supportive; she strongly agreed/agreed with seven of the eight Likert statements investigating this potentially influential variable. Both Diane and Jane disagreed that IWBs were reliable and did not tend to break down. Overall, Jane's responses indicated that she perceived the facilitating conditions surrounding her use of IWBs at the same school to be less supportive; whilst support was available, she had an IWB to use, and the software was suitable, she did not feel encouraged to use an IWB, she was not aware of peripheral items she could use with her IWB, she was short on time to learn to use an IWB, and she hadn't seen other staff members use an IWB.

Table 4.5.6-3

Perceptions of Primary School Teachers Regarding the Facilitating Conditions for Using IWBs

Item No.	Item Statement	Jane	Diane
1.	Support is readily available for using IWBs	A	A
2.	The IWB software suits my intended teaching area	A	A
3.	IWBs are reliable and do not tend to break down	D	D
4.	There is always an IWB available for me to use	A	SA
5.	I am encouraged to use an IWB	D	SA
6.	There are useful peripheral items I can use in conjunction with an IWB	D	A
7.	I have seen how staff members use IWBs	D	A
8.	I have time to learn how to use an IWB	D	A

4.5.7 Analysis of Responses to Likert Statements Investigating Participants' Pedagogy

The eight Likert statements that investigated the seventh potentially influential variable, Pedagogy, are shown in Table 4.5.7-1. The table includes the mean, standard deviation, *t*-value, degrees of freedom, and significance (2-tailed) value gained from independent *t*-tests of the responses of both pre-service teachers and university staff.

Table 4.5.7-1

Participants' Pedagogy

Item No.	Item Statement	Pre-Service Teachers Mean	Pre-Service Teachers Std. Dev.	UTAS Staff Mean	UTAS Staff Std. Dev.	*t*	*df*	Sig. (2-tailed) *p*
1.	IWBs help students learn	3.99	0.673	2.22	1.263	5.819	18.500	.000**
2.	I will not need to change my teaching pedagogy when using an IWB	3.42	0.870	3.06	1.514	0.984	18.752	.338
3.	It is not difficult to think of ways to use an IWB	3.85	0.700	2.94	1.474	2.505	18.185	.020*
4.	My teaching style will not need to change when I use an IWB	3.32	0.886	2.28	1.227	4.409	134.000	.000**
5.	IWBs support mixed learning styles, e.g. visual, kinetic	4.08	0.735	1.83	1.043	8.829	19.653	.000**
6.	Students are more motivated in their learning through an IWB	3.85	0.724	2.44	1.381	4.221	18.448	.000**
7.	My teaching style suits the use of an IWB	3.85	0.758	2.89	1.410	2.824	18.528	.011*
8.	Students like using an IWB	4.09	0.906	2.72	1.447	3.904	19.082	.001**

* $p<0.05$.

** $p<0.01$.

As shown in Table 4.5.7-1, there were statistically significant differences found relating to all statements except for Statement 2 regarding the mean analysis of the scores for pre-service teachers and university teaching staff. Overall, the mean score values for the eight Likert statements investigating the participants' Pedagogy suggest that pre-service teachers' pedagogy was more suited to IWB use than was the pedagogy of university staff. Following is an analysis of each of the eight statements investigating participants' Pedagogy.

Statement 1: IWBs help students learn.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.99) and university staff (M=2.22) regarding whether participants thought IWBs helped students learn (t=5.819, df=18.500, p=0.000). On average, pre-service teachers were more positive in their belief that IWBs helped students learn compared to that of university staff.

Statement 2: I will not need to change my teaching pedagogy when using an IWB.

No statistical significance was evident; a notably high standard deviation was present in university staff results (1.514).

Statement 3: It is not difficult to think of ways to use an IWB.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.85) and university staff (M=2.94) regarding whether it was not difficult to think of ways to use an IWB (t=2.505, df= 18.185, p<0.05). These results indicate that pre-service teachers perceived less difficulty thinking of ways to use an IWB than did university staff.

Statement 4: My teaching style will not need to change when I use an IWB.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.32) and university staff (M=2.28) regarding whether their teaching style would not need to change when they used an IWB (t=4.409, df=134, p=0.000). Pre-service teachers perceived their teaching style to better suit the use of an IWB than did university staff.

Statement 5: IWBs support mixed learning styles, e.g. visual, kinetic.

There was a statistically significant difference between the perceptions of pre-service teachers (M=4.08) and university staff (M=1.83) regarding whether IWBs supported mixed learning styles (t=8.829, df=19.653, p=0.000). On average, pre-service teachers were notably stronger in their perception that IWBs supported mixed learning styles than were university staff.

Statement 6: Students are more motivated in their learning through an IWB.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.85) and university staff (M=2.44) regarding whether students were more motivated in their learning through the use of an IWB (t=4.221, df=18.448, p=0.000). Pre-service teachers perceived IWBs to be more motivating for students in their learning than did university staff.

Statement 7: My teaching style suits the use of an IWB.

There was a statistically significant difference between the perceptions of pre-service teachers (M=3.85) and university staff (M=2.89) regarding whether their teaching style suited the use of an IWB (t=2.824, df= 18.528, p<0.05). These results indicate that pre-service teachers perceived their teaching style to better suit the use of an IWB than did university staff.

Statement 8: Students like using an IWB.

There was a statistically significant difference between the perceptions of pre-service teachers (M=4.09) and university staff (M=2.72) regarding whether they thought students like using an IWB (t=3.904, df= 19.082, p<0.05). Pre-service teachers were more inclined to think that students liked using IWBs than were university staff.

Table 4.5.7-2 is a compilation of the pre-service teachers and university staff members' responses to the eight Likert statements that investigated the seventh variable, Pedagogy. It includes both the number and percentage of responses according to whether the respondent selected Strongly Agree (SA), Agree, (A), Unsure (U), Disagree (D), or Strongly Disagree (SA) for each statement.

Over 90 (77%) pre-service teachers strongly agreed/agreed that IWBs help students learn, compared with two (13%) of university staff. In fact, a further six (40%) university staff members were the only participants who strongly disagreed/disagreed that IWBs help students learn. Approximately half the pre-service teachers (59, 49%) indicated that their teaching pedagogy would not need to change to use an IWB; none of the university staff were of the same opinion, although eight (53%) were unsure. Only four (3%) pre-service teachers thought they would find it difficult to think of ways to use an IWB compared to 12 (80%) university staff members. Eighty seven (73%) pre-service teachers and five (33%) university staff did not consider it difficult to think of ways to use an IWB; the remainder of participants responded unsure (23% and 1% respectively).

Ninety eight (83%) pre-service teachers indicated that IWBs supported mixed learning styles compared to only five (33%) university staff members. Eighteen (15%) pre-service teachers and eight (53%) university staff responded that they were unsure, whilst two (2%) pre-service teachers and five (33%) university staff did not think IWBs supported mixed learning styles. More pre-service teachers (79, 67%) indicated that students were more motivated in their learning through the use of an IWB than university staff members (2, 14%). Interestingly, one (1%) pre-service teacher disagreed that students were more motivated in their learning through the use of an IWB compared to 11 (74%) university staff members. With regard to Statement 8, 87 (74%) pre-service teachers and 5 (34%) university staff strongly agreed/agreed that students like using an IWB, whilst 28 (24%) pre-service teachers and two (13%) university staff were unsure. The remaining three (3%) pre-service teachers and nine (60%) university staff strongly disagreed/disagreed that students like using an IWB.

Table 4.5.7-2

Perceptions of Pre-Service Teachers and UTAS Teaching Staff Regarding IWB Pedagogy

		Pre-Service Teachers					UTAS Staff				
		SA	A	U	D	SD	SA	A	U	D	SD
Item		no	no	no	no	no	no	no	no	no	no
No.	Item Statement	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
1.	IWBs help students learn	26 (22%)	65 (55%)	27 (23%)	0 (0%)	0 (0%)	0 (0%)	2 (13%)	7 (47%)	5 (33%)	1 (7%)
2.	I will not need to change my teaching pedagogy when using an IWB	8 (7%)	51 (42%)	42 (37%)	13 (11%)	3 (3%)	0 (0%)	0 (0%)	6 (40%)	8 (53%)	1 (7%)
3.	It is not difficult to think of ways to use an IWB	17 (14%)	70 (59%)	27 (23%)	4 (3%)	0 (0%)	0 (0%)	5 (33%)	1 (7%)	9 (60%)	3 (20%)
4.	My teaching style will not need to change when I use an IWB	12 (10%)	35 (30%)	50 (42%)	21 (18%)	0 (0%)	0 (0%)	2 (13%)	6 (40%)	7 (47%)	0 (0%)
5.	IWBs support mixed learning styles, e.g. visual, kinetic	33 (28%)	65 (55%)	18 (15%)	1 (1%)	1 (1%)	0 (0%)	5 (33%)	8 (53%)	5 (33%)	0 (0%)
6.	Students are more motivated in their learning through an IWB	22 (19%)	57 (48%)	38 (32%)	1 (1%)	0 (0%)	1 (7%)	1 (7%)	2 (13%)	10 (67%)	1 (7%)
7.	My teaching style suits the use of an IWB	25 (21%)	51 (43%)	41 (%35)	1 (1%)	0 (0%)	0 (0%)	7 (47%)	0 (0%)	8 (53%)	0 (0%)
8.	Students like using an IWB	47 (40%)	40 (34%)	28 (24%)	1 (1%)	2 (2%)	1 (7%)	4 (27%)	2 (13%)	9 (60%)	0 (0%)

The two primary school teachers' survey responses to the eight Likert statements that investigated the seventh variable, Pedagogy, are presented in Table 4.5.7-3; participants selected either Strongly Agree (SA), Agree, (A), Unsure (U), Disagree (D), or Strongly Disagree (SA) for each statement. Overall, Diane's pedagogical understanding of the use of IWBs aligned better with using IWBs than did Jane's. Although neither Diane nor Jane reported having difficultly thinking of ways to use an IWB, Diane strongly agreed that IWBs help students learn whilst Jane was unsure. Whilst Diane strongly agreed that IWBs support mixed learning styles and that students were more motivated in their learning through the use of an IWB, Jane disagreed in both instances. Diane's responses indicate that she believed her pedagogy suited the use of an IWB whilst Jane indicated that her pedagogy would need to change.

Table 4.5.7-3

Perceptions of Primary School Teachers Regarding IWB Pedagogy

Item No.	Item Statement	Jane	Diane
1.	IWBs help students learn	U	SA
2.	I will not need to change my teaching pedagogy when using an IWB	D	A
3.	It is not difficult to think of ways to use an IWB	A	A
4.	My teaching style will not need to change when I use an IWB	D	A
5.	IWBs support mixed learning styles, e.g. visual, kinetic	D	SA
6.	Students are more motivated in their learning through an IWB	D	SA
7.	My teaching style suits the use of an IWB	D	SA
8.	Students like using an IWB	D	SA

4.6 Key Differences Between the Perceptions of Pre-Service Teachers and University Staff in Relation to the Variables Examined in the Survey

In order to identify key differences between the perceptions of pre-service teachers and university staff, their mean responses to each of the 56 Likert statements investigating the seven variables in the survey were compared.

Figure 4.6.5-1 is a comparison of the eight Likert statements investigating participants' perceptions regarding the usefulness of IWBs. It is evident that the pre-service teachers were overall more positive regarding how useful they perceived IWBs to be compared to university staff as indicated by their responses to all eight statements. The most extreme difference was the very positive perception of pre-service teachers, that IWBs are a useful teaching tool, compared to the much lower mean perception of university staff. Pre-service teachers were also noticeably more positive regarding the usefulness of IWBs when re-capping teaching points, and that using an IWB would improve their teaching.

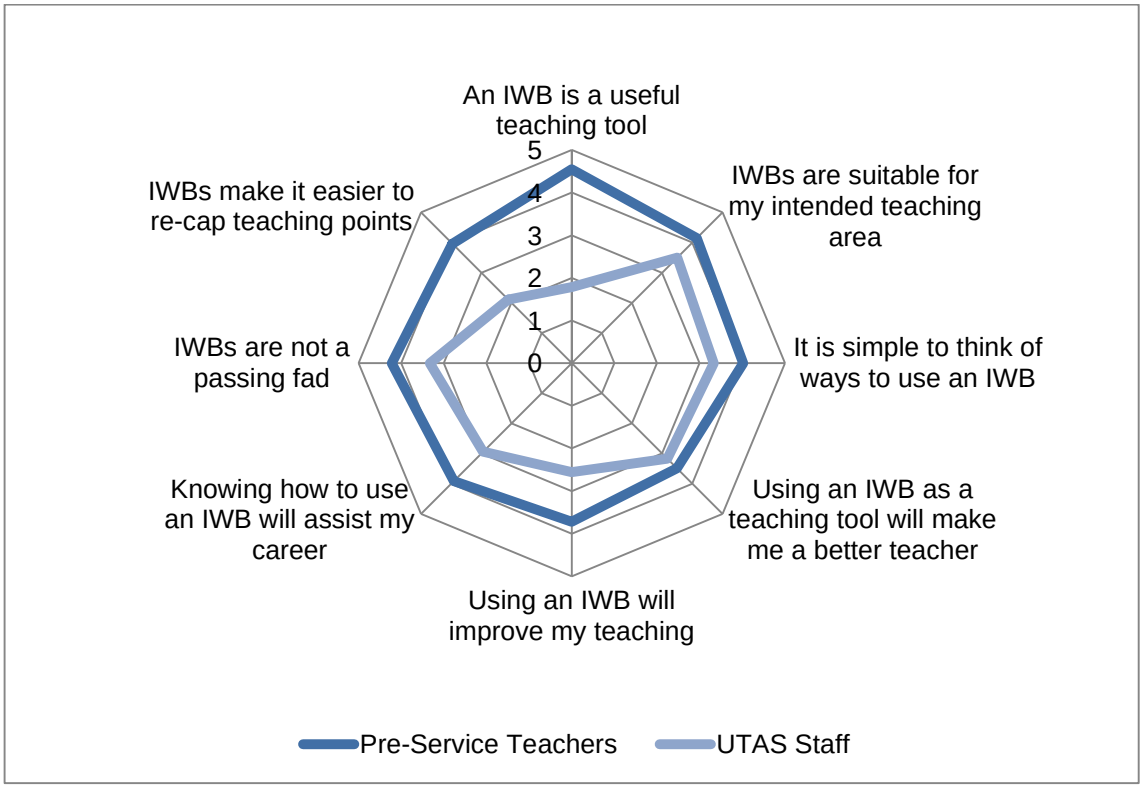

Figure 4.6.5-1. Variable 1: Perceived Usefulness of IWBs.

The means of participants' responses to the eight Likert statements investigating attitude towards IWB use are compared below in Figure 4.6.5-2. It is evident that overall the pre-service teachers were more positive in their attitude towards IWB use than were university staff as indicated by their responses to all of the eight statements. Of particular note was the different perceptions of participants regarding IWBs as an important teaching tool, and that good IWB skills are important; on average, pre-service teachers thought both things were important, whereas university staff did not. Also notable through the mean comparisons was that pre-service teachers liked and favoured using IWBs more than did university staff.

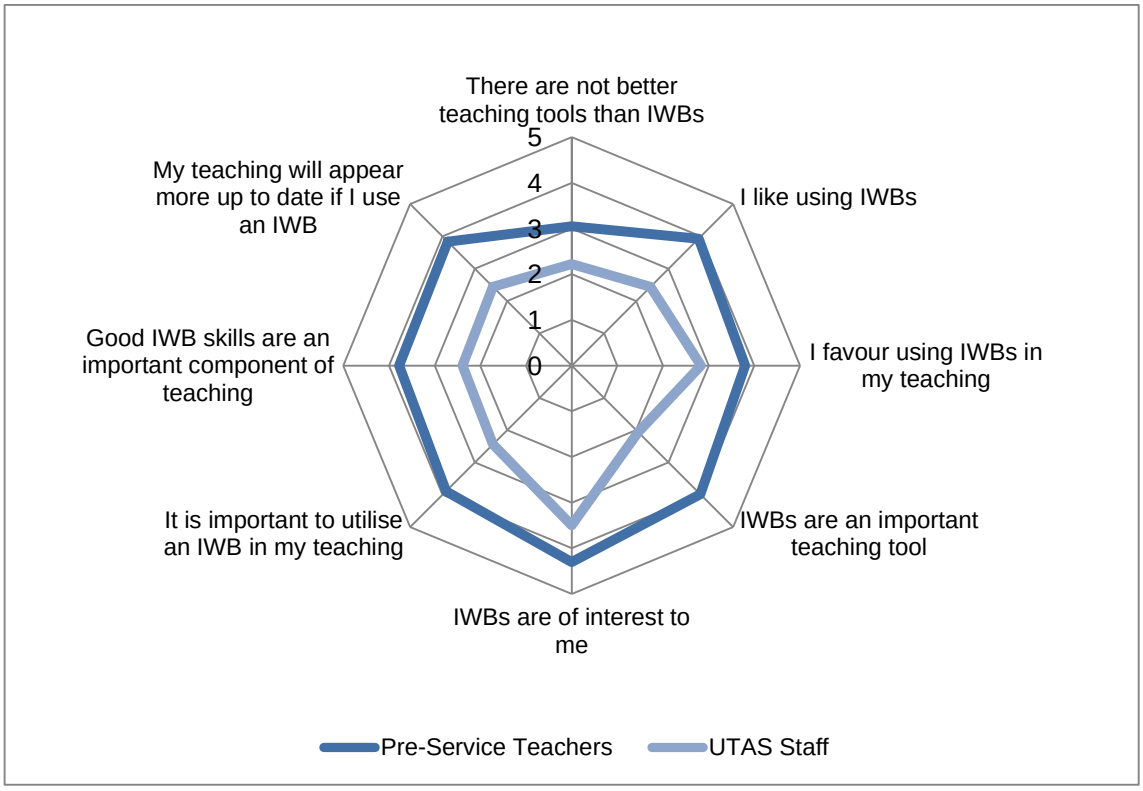

Figure 4.6.5-2. Variable 2: Attitude towards IWB Use.

Analysis of Figure 4.6.5-3 shows that pre-service teachers were overall more confident regarding their attitude towards IWBs than were university staff members. On average, pre-service teachers thought they could learn if someone showed them how to do it, whereas university staff did not. University staff members were still notably more negative than pre-service teachers in using an IWB even if help was available if they had trouble. Both participant groups were similar in their responses regarding whether they thought they possessed adequate IWB skills to teach with one; pre-service teachers were unsure (*M*=2.97), as were the slightly more negative university staff (*M*=2.67).

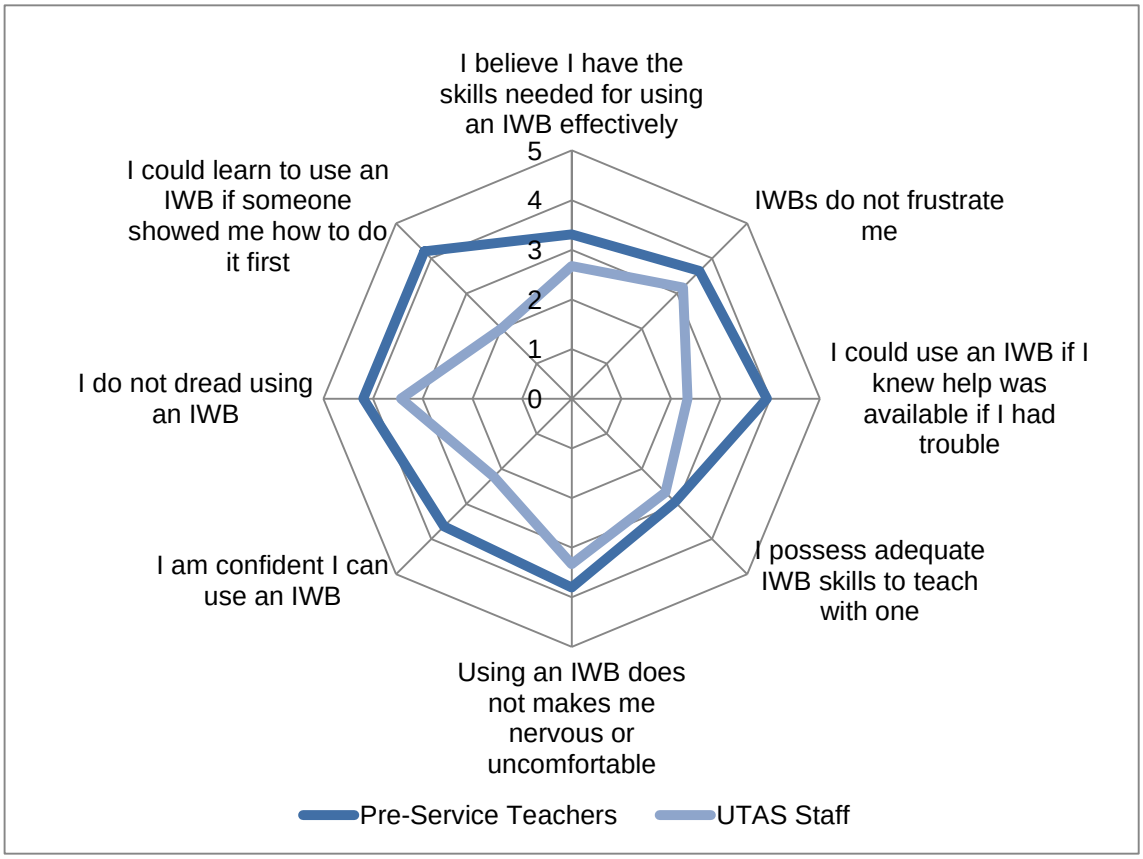

Figure 4.6.5-3. Variable 3: Self-Efficacy with IWBs.

Examination of Figure 4.6.5-4 reveals that pre-service teachers perceived IWBs to be easier to use than did university staff. Neither participant group were sure how simple or challenging IWBs were to use, nor were they sure about whether using an IWB would enable them to be more organised. Pre-service teachers thought IWBs were worth the effort needed to use them; however university staff members were on average unsure about this.

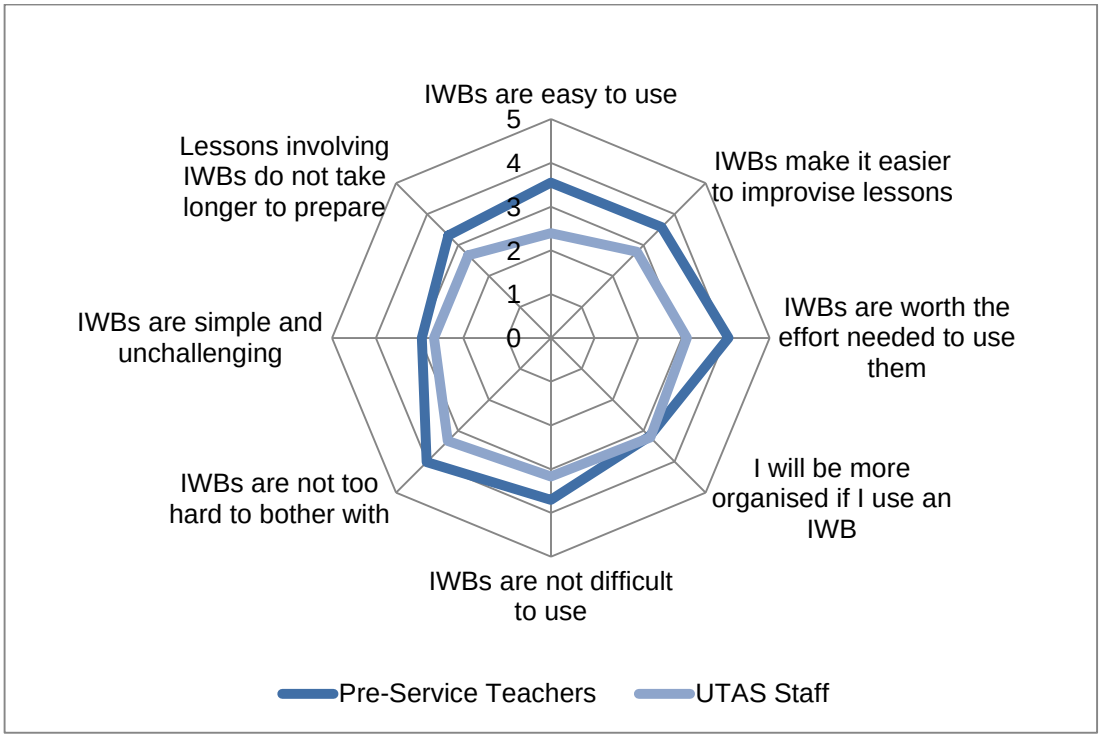

Figure 4.6.5-4. Variable 4: Perceived Ease of Use of IWBs.

Figure 4.6.5-5 shows that on average, university staff thought IWBs were more technologically complex than did pre-service teachers. However, it is also evident that pre-service teachers were unsure about difficulties relating to troubleshooting IWB issues, whilst university staff tended to agree that it was difficult.

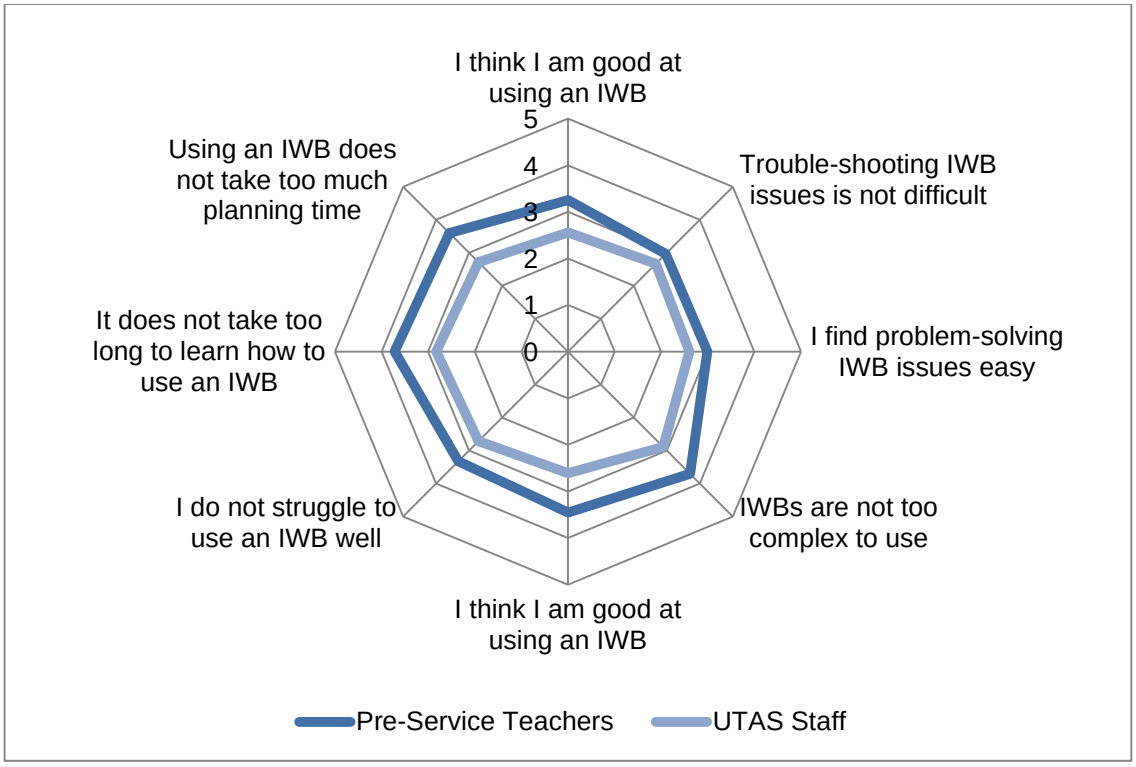

Figure 4.6.5-5. Variable 5: Technological Complexity of IWBs.

It is evident from Figure 4.6.5-6 that on average, neither participant group perceived particularly conducive facilitating conditions for using an IWB as a teaching tool. The mean results hovered around the unsure zone for all eight statements. Of particular note was that neither group consistently had access to an IWB. Equally notable was the lack of encouragement to use an IWB experienced by both pre-service teachers and university staff.

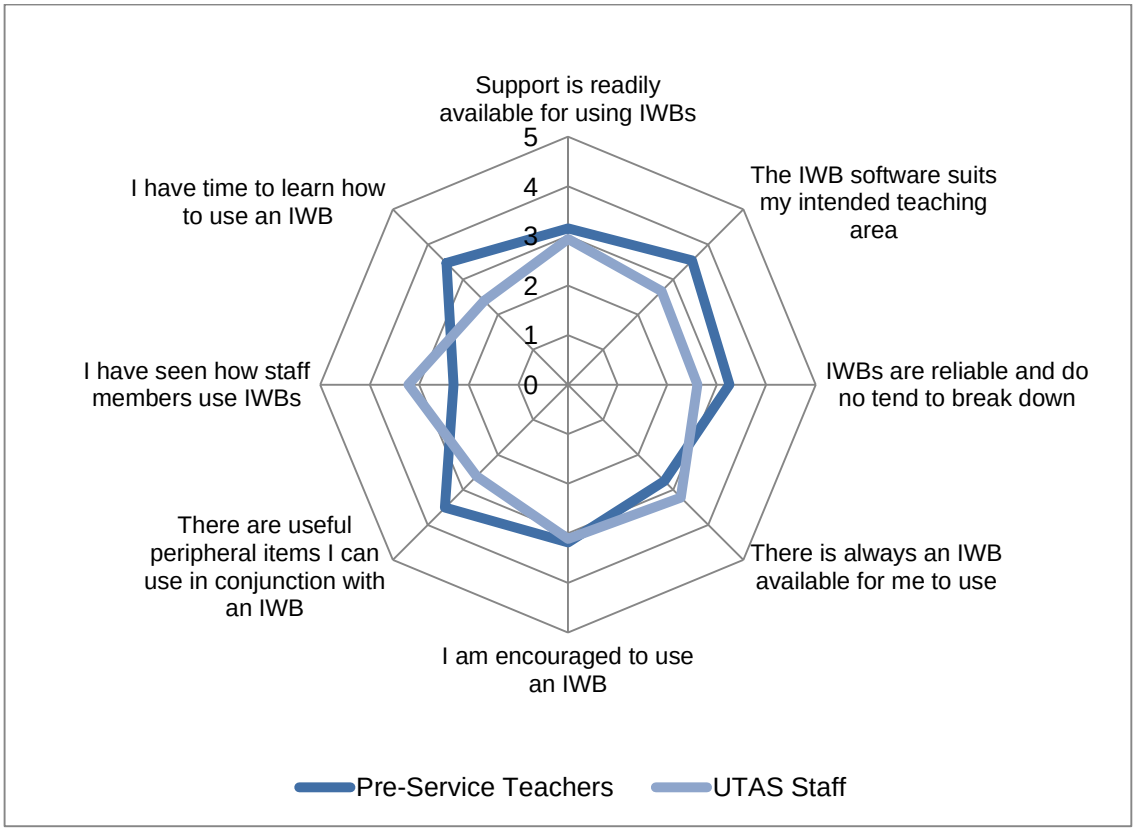

Figure 4.6.5-6. Variable 6: Facilitating Conditions for Using an IWB.

The different perceptions of the pre-service teacher and university staff members regarding the teaching pedagogy for using an IWB are evident in Figure 4.6.5-7. Pre-service teachers were on average more positive than university staff in relation to how well their teaching pedagogy aligned with using an IWB. In particular, they thought that IWBs supported mixed learning styles, motivated students, and that students liked using them, whereas university staff responses averaged between unsure to disagreeing with these statements.

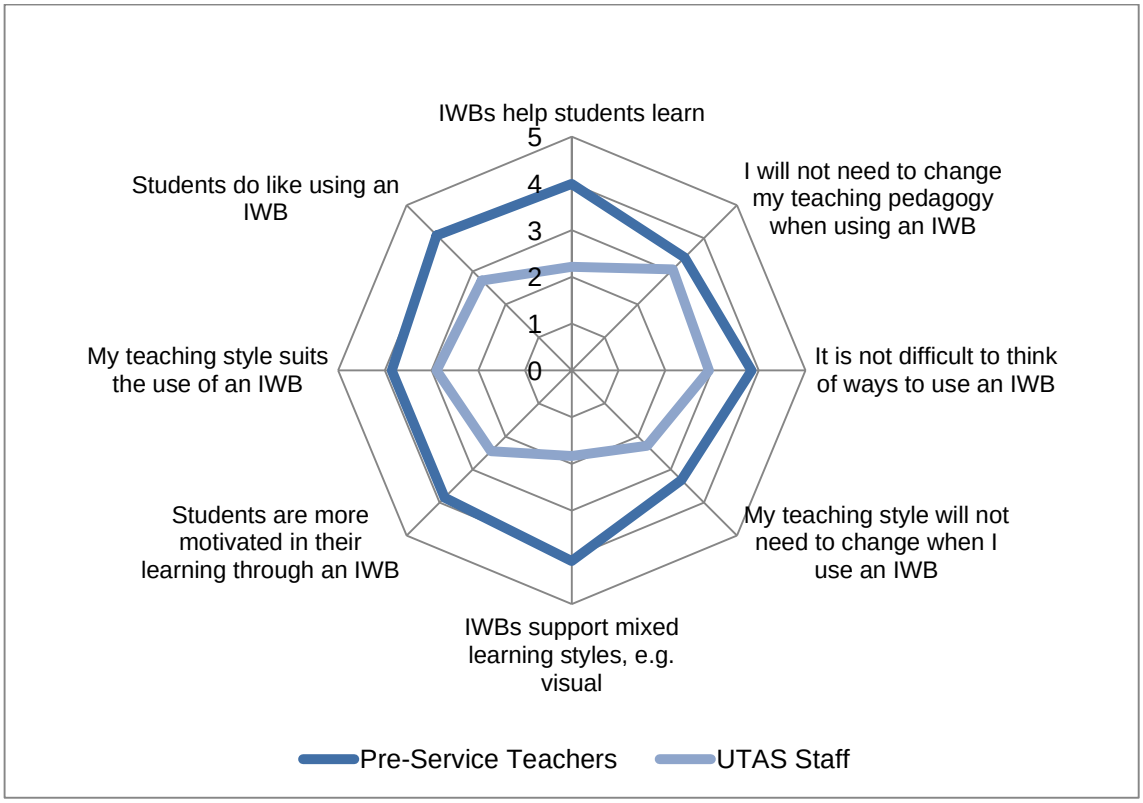

Figure 4.6.5-7. Variable 7: Pedagogy for Using an IWB.

4.7 Summary

Details of the data collected by the survey in relation to Research Questions 1, 2, 3 and 4 were presented in this chapter, as were the key differences identified between the perceptions of pre-service teachers and university staff regarding the seven variables investigated by the survey. The following chapter, Chapter 5, examines the interview data regarding Research Questions 1, 2, 3 and 4, as well as five themes uncovered through the semistructured interviews, as described in Section 3.6.2 of Chapter 3.

Chapter 5

INTERVIEW RESULTS

5.1 Chapter Outline

A detailed description of the data collected from the 21 interviews is presented in this chapter. Reference is given to the four Research Questions and data examined in Chapter 4. Before commencement of the interviews, consent was gained from all participants. Approximately 11 hours of semi-structured interviews were conducted and audio-taped. The interview transcriptions were emailed to the participants for scrutiny and comment; five minor changes were requested and complied with, and two additional comments were added by request.

A set of open-ended questions were used to guide the interviews (Appendices I-K) with the view of learning more about each participant's individual experience and perspective, "how a respondent thinks, [and] to discover what is really important to him or her" (Neuman, 2004, p. 172). In this presentation of the results, each participant is introduced with a brief overview using a pseudonym which is maintained throughout this study to preserve anonymity. In instances where direct quotes have been used, the corresponding page and line number from the participant's transcript is provided in parentheses (e.g., 3:48-49).

It was anticipated that approximately 12 interviews would be conducted with each of the three participant groups; however the low number of primary school teacher respondents resulted in only one interviewee participant from this group. In addition, only two of the 18 university staff members consented to be interviewed, hence there are two interview participants from this group. From the pre-service teacher participant group, 18 people consented to be interviewed, and all 18 were subsequently interviewed. The interview data were examined in relation to each of the four research questions.

5.2 Interview Data Related to Research Question 1

Research Question 1: *What is the nature and extent of preparation of the pre-service teachers enrolled in the Bachelor of Education course at UTAS for using IWBs as a teaching tool?*

As can be seen in Table 5.2-1, of the 18 pre-service teacher interview participants, only one, Emily, had received any form of IWB education at university. Her interview results are presented in Section 5.2.1. Four of the other pre-service teachers who consented to an interview had seen an IWB being used at university, but had not received any IWB education; these were Andrea, Harry, Tina and Robyn, whose interview results are presented in turn in Sections 5.2.2, 5.2.3, 5.2.4 and 5.2.5. The remaining 13 pre-service teachers' IWB experiences at university or reasons for the lack thereof are discussed in Section 5.2.6. Pre-service teachers' IWB education experiences whilst on professional experience are then examined in Section 5.2.7. This is followed by the education in IWB use experienced by the remaining 14 interview participants (Section 5.2.8), and the pre-service teachers' experiences with IWBs as high school students are presented in Section 5.2.9.

Table 5.2-1

Overview of the 18 Interview Participants

Pseudonym	Gender (Male/ Female)	Age Range (Years)	Year of Study	IWB Ed. at UTAS (Yes/No)	IWB Ed. on Prof. Exp. (Yes/No)	Expect to use IWB as a teacher (Yes/No/ Maybe)	Prepared to use an IWB (Yes/No/Maybe)
Emily	F	41-50	3	Y	Y	Y	M
Andrea	F	31-40	2	N	N	N	Y
Harry	M	18-25	3	N	Y	Y	Y
Tina	F	18-25	3	N	N	Y	M
Robyn	F	31-40	4	N	Y	Y	Y
Lisa	F	61+	4	N	Y	M	Y
Elizabeth	F	51-50	3	N	Y	Y	M
Annie	F	41-50	2	N	Y	Y	Y
Jenny	F	41-50	4	N	N	Y	M
Marge	F	31-40	2	N	N	Y	Y
Julie	F	31-40	1	N	N	Y	M
Katie	F	18-25	3	N	N	Y	N
Jenna	F	31-40	1	N	N	Y	M
Alice	F	51-60	1	N	N	Y	Y
Susan	F	51-60	3	N	N	Y	Y
Jill	F	18-25	1	N	N	Y	Y
Jeannine	F	18-25	3	N	N	Y	M
Maddy	F	26-30	1	N	N	Y	N

5.2.1 Emily

Emily, a third year student of 41-50 years of age, described herself as being usually quite confident with using technology and believed that her confidence was a positive influence on her attitude towards IWB use: "I'm excited about them [IWBs]" (1:8). Emily had gained some experience on a whiteboard with a sensor setup attached during her teacher education course, however she noted that its capabilities were very limited compared to the IWBs she had seen used in schools. Nevertheless, she felt her experience had been valuable, as it had introduced her to the concept as well as some of the ways an IWB could be used. Emily did not feel very well prepared for using an IWB in her teaching career and would like more education with them and to see IWBs used more at UTAS. She did not feel very confident with troubleshooting IWB issues, having observed the negative impact of technical issues when on professional experience. This was particularly concerning for her as the level of support that had been available in the schools in which she had professional experience had been limited: "if you need help with your Interactive Whiteboard then you may have to pack it away for a month as the support person only comes up once a fortnight" (3:145-146).

5.2.2 Andrea

Andrea, a 31-40 year old in the second year of her teacher education course, indicated that her experience with IWBs at university was limited to static PowerPoint presentations projected onto the screen. Although she described herself as very capable and confident with technology, she said she had "absolutely no idea how IWBs work, what they are capable of, or how (she) would use them in the classroom" (1:16-17). She did not feel at all prepared for using an IWB in the classroom when she attained a teaching position. Andrea felt that she had no understanding of any the basic features of an IWB, "let alone the pedagogy for using one. I think I first need to know the features and the capabilities of it" (3:114-116). Andrea strongly believed that education in the use of an IWB would have been beneficial for her teaching, and would have liked to have seen them integrated into tutorials: "To me, one of the main benefits of the tutorials is using the wealth of experience of the people who are taking the tutorials, and for them to be able to say, this is how we teach fractions in a school, but this is how you could incorporate an IWB to enhance your teaching. These are the products available for mathematics teaching and this is what the IWB is capable of

doing" (2:97-102). Andrea thought that IWB education at university was "desperately needed … all teachers before they go out to schools need training in how to use the technologies available, otherwise it's a waste of money … There's nothing to be scared of, just get out and do it – and let us use it!" (3:137-140).

5.2.3 Harry

Harry, an 18-25 year old in the third year of his teacher education course, considered himself to be "quite technologically minded" (3:158). He had observed IWBs installed in the rooms in which he had several course units, but they had only been used as a screen for a data projector and he had not received any education in their use. Harry was anticipating learning how to use an IWB in his ICT unit in his fourth year of study, but believed it would have been more beneficial to his teaching if IWBs had been integrated into his earlier years of study as his teaching style was still developing. To achieve this, Harry felt that some of the university staff members needed education in the use of IWBs: "It's not their fault; they just haven't been taught or shown how to do it either" (4:205-206). He felt it would be a big improvement and very beneficial to pre-service teachers if university staff members could embed IWBs in their teaching: "As a student you pick up little things that each teacher does and you hold that with you, so if IWB skills and different approaches were shown, it could make a big difference" (4:222-223).

5.2.4 Tina

Third year pre-service teacher, 18-25 year old Tina, was a confident user of technology. However, like Andrea, her experience with IWBs at university was limited to one unit in which it was used to show PowerPoint presentations. Tina felt that IWB education would have been beneficial to her preparation as a teacher: "To be honest, I'm not very confident. I'm confident in my ability to adapt and learn quickly … but if I had to use one straight away, I would not feel competent at all" (3:118-119). Tina would have liked to learn more about the technical side of IWBs initially, then learn about various software programs available, and then develop her understanding of the pedagogical aspect of using IWBs. She suggested that weaving IWBs into a range of subject units would be "an easy and beneficial way for us [pre-service teachers] to learn how to use them" (3:113).

5.2.5 Robyn

Robyn, a 31-40 year old fourth year pre-service teacher, was very confident with using technology. She was disappointed that she had not received any IWB education or even seen one being used at university, except for one unit in which she used an IWB to present a PowerPoint for an assessment task. Robyn believed that teacher education courses should include IWB education because "when teachers are training at university they should actually be able to be exposed to the technology they are going to be expected to use in schools … we need to have some training for it before we hit the school environment" (1:21-28). She expressed concern for pre-service teachers who were not comfortable with using technology; "if they are going into a placement with a teacher who is themselves not comfortable with using an IWB, then we end up creating this cycle where, instead of introducing new ideas and new technology at a level they are comfortable with and being prepared and knowing how to learn how to use the technology, we get to a situation where if you are uncomfortable, you stay uncomfortable" (4:194-199).

5.2.6 Pre-Service Teachers without IWB Experiences

Seven of the interview participants (Annie, Marge, Jeannine, Susan, Alice, Lisa, and Elizabeth) were unsure whether education in using an IWB was available at university or not because their study had been undertaken completely by distance and it was not part of the units they had done. All seven of these pre-service teachers indicated that IWB education would have been beneficial to their preparation as a teacher. Annie felt that knowing how to use an IWB could "unlock opportunities for you" (2: 61). She felt that all teachers should have education in IWB use for the benefit of student learning, because "not everyone is using them to their maximum potential … we need to embrace it ourselves because it is their [the students'] world" (7:377-383). Marge, Susan, Alice, Lisa and Elizabeth all thought that professional development with using IWBs would have been beneficial to their teaching. In Susan's words, "I actually think it is something that should be included in our studies at uni as it is something that is becoming more and more predominant in the classroom" (4:177-178). Her lack of IWB education had made Elizabeth feel underprepared and "a little embarrassed about not knowing much about it … I can't walk in [to a teaching position] and say I have done my degree at UTAS and that I know how to use one" (1:44-46). Furthermore, she was "not prepared to go and turn it on and use it … I'd

need someone to show me how to do it" (2:106-108). Jeannine felt that she would probably try to use an IWB in her own classroom, "but it would be very daunting" (2:107). Furthermore, she would definitely like to have learnt more about the pedagogy associated with using an IWB and about appropriate software applications.

The remaining six interview participants (Katie, Jenny, Julie, Jill, Jenna and Maddy) had not received any education in using an IWB because none had been available. For Katie, this was disappointing, "considering that in all bar one school that I have been in, they are pretty heavily used. Now they are just about in every classroom and yet I have only seen them in one classroom at UTAS" (1:16-18). Katie's professional experiences in classrooms made her realise that she would need to change her teaching style if she were to effectively incorporate an IWB into her teaching. Jenny thought that she was not very well prepared for using an IWB and that education in all aspects of its use would be very much an advantage for her as a teacher as they are "part of schools' technology now" (2:102). Julie felt that IWB education should be mandatory because "there are a lot of practical skills that aren't taught or modelled and integrating something like that into everyday teaching would assist teachers to then use them in their own practice" (1:22-24). Julie noted that one of her lecturers had tried to use it, but did not make any attempt to teach pre-service teachers how to use it. Julie expressed concern that the lack of IWB education experienced by pre-service teachers may extend to the teachers teaching her at university. She felt it was impossible for university staff members to teach pre-service teachers to use IWBs if "they aren't given opportunities to use them if they are not in the class we are in" (2:106-107). Jill also thought IWB education was needed to avoid teachers using an IWB just as a whiteboard and ignoring their interactive potential. Jenna felt that she was not at all well prepared for teaching with an IWB. She noted that she had seen IWBs in tutorial classrooms in her first year of her teacher education course, but that not once had she seen one being used. However, she had been told that she had the opportunity to try them in her own time, and she had been encouraged by one lecturer to learn about IWBs by going "out into the universe and learn new things and to skill up" (1:22-23). Jenna suggested that it would have been a good idea to integrate IWBs into the various lesson plans they wrote for assessment tasks in different units. However, Jenna also acknowledged that this could be difficult for pre-service teachers who did not know much about them. Maddy had grown up in an environment with

very limited access to technology and hence was reluctant to use it. She did not believe she was at all prepared for using an IWB in her future teaching career and had only seen an IWB used as a projector screen for watching videos. Maddy felt that she would need to change her teaching style and recognised that she would definitely need to learn a lot more to be able to use an IWB effectively: "It would be good to at least see them used in tutorials and things like that so we know how to use them ourselves" (3:152-153).

5.2.7 IWB Education during Professional Experience

All 18 pre-service teacher interviewees had either used an IWB or had observed one being used during his or her professional experiences. Table 5.2.7-1 is a compilation of the IWB use experienced or observed by the interview participants' during their professional experiences. It includes details relating to whether the colleague teacher (T), the student/s (S), the pre-service teacher (P), or no one (N) used the IWB. It also shows whether the type of IWB use was interactive or non-interactive. The frequency of IWB use by each pre-service teacher is noted (i.e. often, occasionally, rarely or never), and details of issues experienced are provided. It is evident that the experiences of each pre-service teacher varied greatly.

Table 5.2.7-1

Overview of IWB Use during Interview Participants' Professional Experience

Pseudonym	IWB Ed. received on Prof. Exp?	Who used the IWB?	Type of IWB Use	Frequency of IWB use by Pre-Service Teacher	Issues Encountered
Jenna	No	T/S	Non-interactive	Rarely	Pre-service teacher didn't know how to use it.
Andrea	No	T	Non-interactive	Never	Prof. Exp. 1: Teacher didn't turn the IWB on. Prof. Exp. 2: Teacher used it to play video clips. Prof. Exp. 3: Teacher used it to show PowerPoint presentations. Teacher hadn't had any IWB training.
Harry	Yes	T/S	Interactive	Often	Teacher needed IWB professional learning (couldn't calibrate IWB). Technical issues.
Tina	No	T	Non-interactive	Occasionally	Teachers frustrated by lack of IWB training. Poor classroom management of IWB. Technical issues.
Robyn	Yes	T/S	Interactive	Often	The available IWB did not have the IWB software that she had learnt to use. Technical cabling problem.
Lisa	No	P	Non-interactive	Occasionally	Connection issues. Out of focus. Needed technical support.
Elizabeth	No	T/S	Interactive	Occasionally	Unreliable. Slow internet connectivity.

Pseudonym	IWB Ed. received on Prof. Exp?	Who used the IWB?	Type of IWB Use	Frequency of IWB use by Pre-Service Teacher	Issues Encountered
Annie	No	T/S	Interactive	Often	YouTube blocked. Technical issues. Ineffective use. Poor classroom management using an IWB.
Jenny	No	T	Interactive	Never	Technical issues. Lack of IWB training.
Marge	No	T	Interactive	Occasionally	Unable to troubleshoot technical issues due to lack of training. IT support only available once a week.
Julie	No	T	Non-interactive	Rarely	Neither Julie nor the teacher knew how to use IWB. Could not calibrate it.
Katie	No	T/S	Interactive	Occasionally	Lack of IWB training
Emily	Yes	T/S	Interactive	Never	Technical issues. Lack of technical support.
Alice	No	T/S	Non-interactive	Occasionally	Technical problems. Unreliable. Lack of IWB training
Susan	No	T/S	Interactive	Occasionally	Technical issues. Inappropriate IWB pedagogy.
Jill	No	T	Non-interactive	Never	Colleague teacher's inability to use IWBs effectively.
Jeannine	No	T/S	Interactive	Often	Unreliable.
Maddy	No	N	Not used	Never	Neither Maddy nor the teacher knew how to use it.

The type of education in IWB use received by the three participants who did receive such education during their professional experience (Harry, Robyn and Marge) is shown below in Figure 5.2.7-1. Harry experienced 10 of the 12 types of IWB education, Robyn six, and Marge one). All three participants indicated that they had learned how to use it as a motivational tool to support student learning.

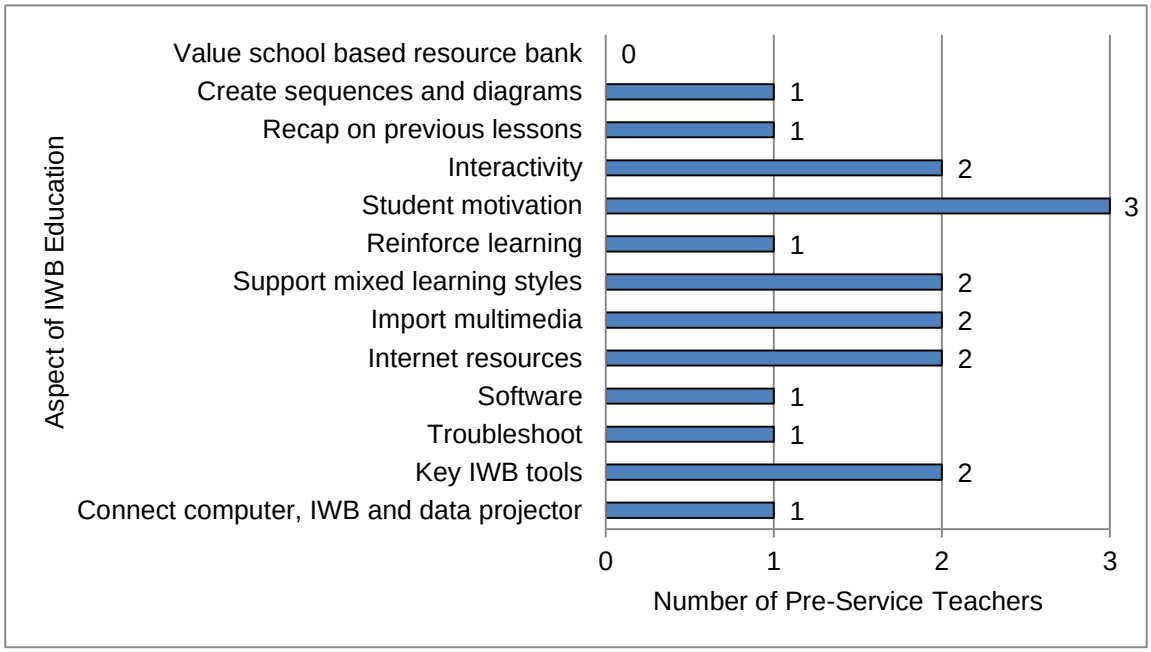

Figure 5.2.7-1. IWB Education Received by Pre-Service Teachers during Professional Experience.

As can be seen in Figure 5.2.7-2, ten pre-service teachers observed IWBs being used in an interactive manner during their professional experiences. A further seven pre-service teachers observed non-interactive use, and one pre-service teacher observed an IWB completely unused in a classroom.

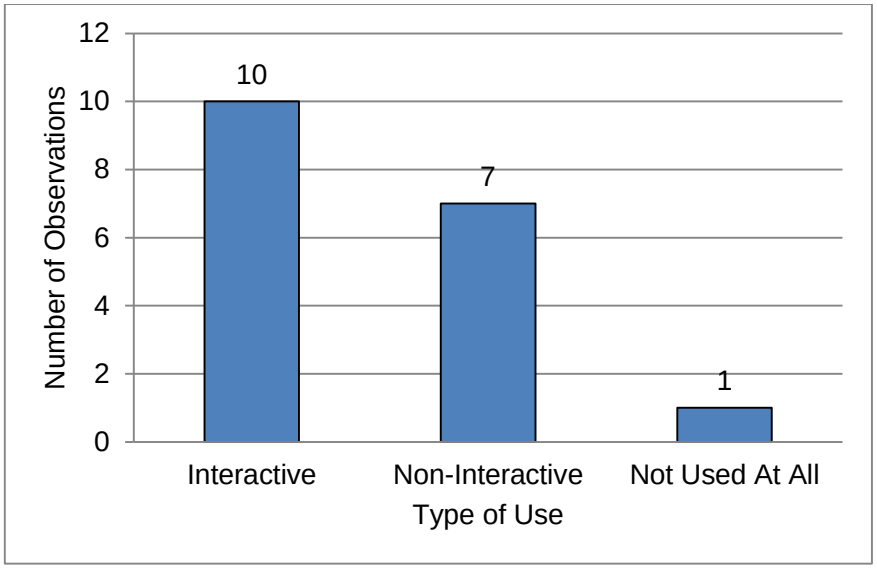

Figure 5.2.7-2. Type of IWB Use Observed by Pre-Service Teachers during Professional Experience.

Figure 5.2.7-3 depicts the frequency with which pre-service teachers used an IWB during their professional experiences. Seven out of the 18 participants used an IWB occasionally, four used one often, two used one rarely, and five pre-service teachers did not use one at all.

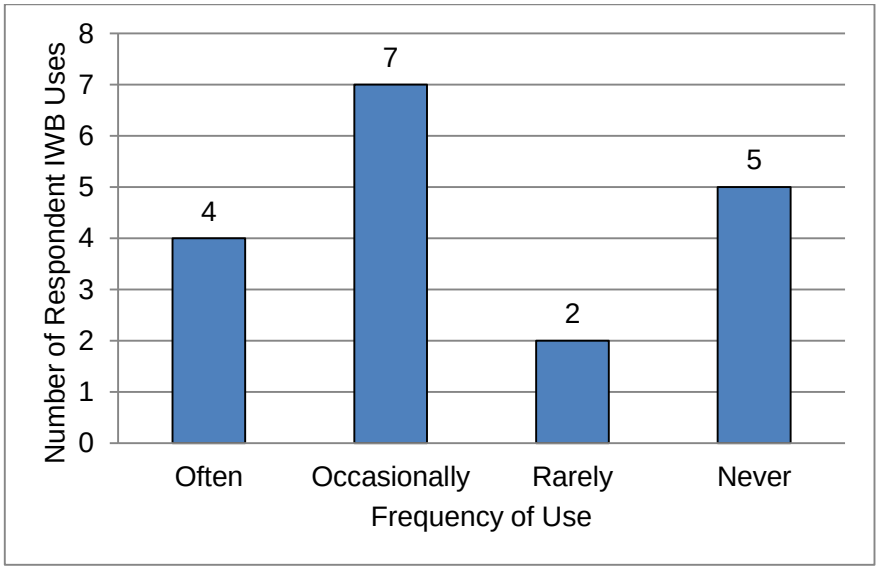

Figure 5.2.7-3. Frequency of IWB Use by Pre-Service Teachers during Professional Experience.

As can be seen below in Figure 5.2.7-4, 16 of the 18 pre-service teacher interviewees observed their colleague teachers using an IWB during their professional experiences. Of these pre-service teachers, 11 observed student IWB interaction, one IWB was used only by the pre-service teacher, and one IWB was not used at all.

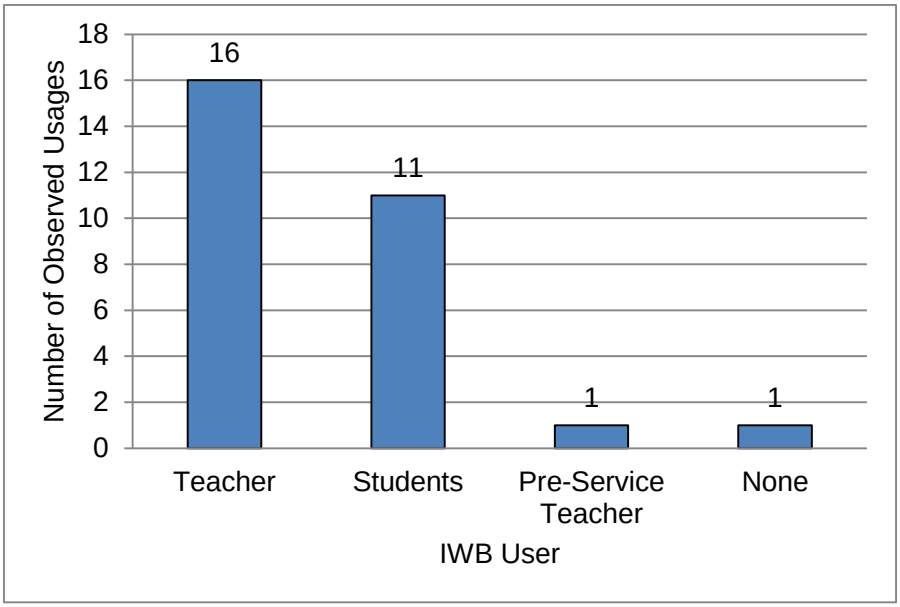

Figure 5.2.7-4. Pre-Service Teachers' Observations of IWB Users during Professional Experience.

Overall, 14 of the 18 interviewees indicated that one or more of their colleague teachers on their professional experiences needed education in the use of IWBs. Basic technical issues that could not be solved by either the colleague teacher or the pre-service teacher were noted by 12 of the 18 interviewees, and there were five more complex technical issues that required IT support staff intervention, which was not immediate in most cases. Issues stemming from unreliable technology were also noted by three respondents. Ineffective pedagogical use was reported by five pre-service teachers.

Three of the 18 interview participants, Harry (5.2.7.1), Robyn (5.2.7.2) and Marge (5.2.7.3) received IWB education during their professional experiences. All three participants learned from watching colleagues, two learned from external experts and self-exploration of IWBs, one learned from students, and none learned from an expert internal to the school (Figure 5.2.7-5).

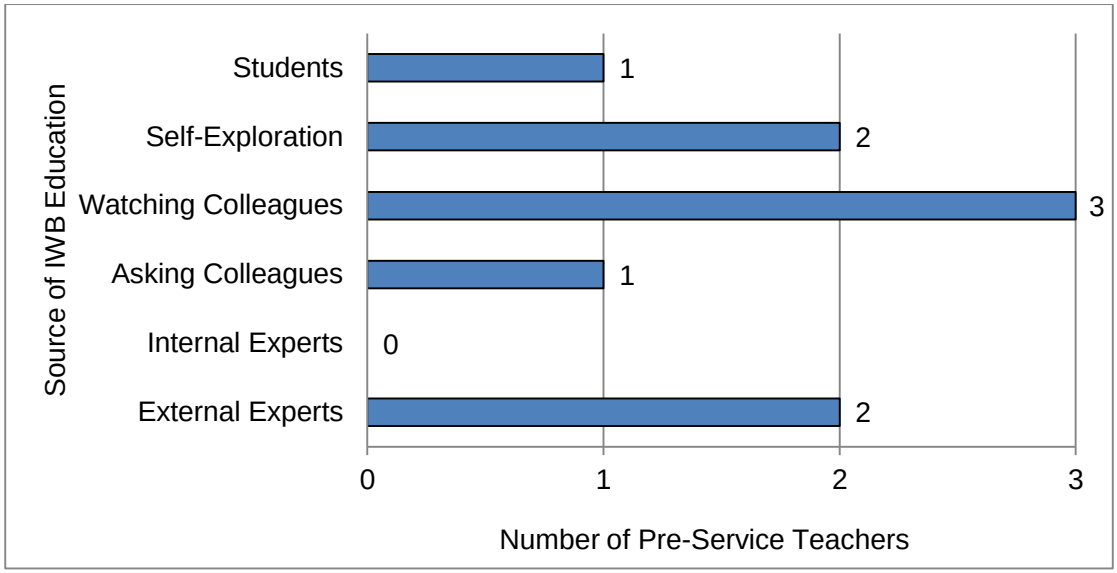

Figure 5.2.7-5. Source of IWB Education for Pre-Service Teachers during Professional Experience.

5.2.7.1 Harry

Harry's IWB education stemmed from his second and third professional experience placements. His colleague teacher on his second professional experience was "really good at using the IWB" (1:46), and showed him numerous interactive educational games for various curriculum areas. On his third professional experience, Harry attended a professional development session at the school taken by an external IWB trainer. Harry's colleague teacher had shown great interest in this session as she was very interested in developing her skills because she had not known much about IWBs prior to the session; "we were able to explore and go through it all together" (3:123). This was very beneficial for Harry: "After just getting a bit of an experience with it once and having a bit of confidence in it and seeing the capabilities of it, I feel it just pushed me to want to use it more" (3:159-161).

5.2.7.2 Robyn

Robyn's IWB experiences during professional experiences also varied. One colleague teacher was not confident with technology and "basically used it as a projector" (3:123). A colleague teacher on a different professional experience was very comfortable using an IWB and inspired Robyn to have "the enthusiasm and the courage to try other things with it" (4:171). Robyn also received IWB education from an IWB expert who provided IWB education for staff members in the school in which

she was doing professional experience. In the time that lapsed between completing the survey and doing the interview for this study, Robyn had attained a teaching position. Robyn said that she was fortunate to be teamed with a teacher who was also keen to use the IWBs in their classrooms, which was very beneficial as they had shared and brainstormed ideas together and experimented with different ways of using them.

5.2.7.3 Marge

Marge described the IWB education she received on professional experience as "very minimal" (1:19). She believed it was due to a lack of professional learning for the teachers, hence poor IWB use and the inability to troubleshoot common issues that she observed: "People just get frustrated and go, 'nope, too hard'" (1:20). However, she learnt how to use the 'drag and hide' functions and how to connect it to a data projector, and observed the IWB being used for a Literacy lesson. Marge had also been impressed by how well the IWB held the students' attention.

The experiences of the remaining 14 interview participants with regard to IWBs during professional experience are examined in 5.2.8.

5.2.8 IWB Education Experiences for the Remaining 14 Interview Participants

Jenna was disappointed that the teacher that supervised her professional experience hadn't known a lot about them; the IWB was used only as a screen for the data projector, so "it would have been a lot better going in more prepared" (2:101-102). Tina also wished she had known a more about IWBs before her first professional experience because she had "never seen one before – I had no idea what it was. It was just scary! You've got all that anxiety in your first prac anyway, and it'd be nice to have one less thing to be scared of" (4:177-179). Tina reported that her colleague teacher was excited about having an IWB in her classroom, but was also frustrated because she did not know how to use it. Maddy's colleague teacher asked her to use the IWB in the classroom, but she was unable to comply because she "had no idea" (2:87). Furthermore, the "teacher didn't know how to use it either so she couldn't teach me (2:87). Andrea's experiences with IWBs whilst on professional experience were also very limited. On her first professional experience, the colleague teacher did not turn the IWB on and her second and third colleague teachers only used IWBs as

projector screens. Andrea recalled the third colleague teacher saying that "she was still trying to find a way herself with how to use it because she hadn't had any professional development or training" (3:151-152).

Lisa did not feel that the lack of IWB education she experienced at university was detrimental to her future because she learnt how to use them during her professional experience: "I don't think that their use [at UTAS] would be that crucial. It would have been handy, but it was just so simple and easy to learn as part of my prac. I didn't feel that I was disadvantaged" (1:19-21). According to Katie, the colleague teacher who supervised her second professional experience was unable to provide her with any IWB education as she was not competent at using it herself. The teacher had prepared a lesson using the IWB, but she could not get the IWB working and had to revert to alternate teaching methods, which made the students "a bit restless … I think there were a few spit bombs fired around the room" (4:186). However, Katie's third professional experience was more successful as the colleague teacher was "quite savvy" (2:89) with technology and could use the IWB effectively. He had the students "wrapped around his little finger which was brilliant and they were learning heaps faster … and not getting distracted as easily in the classroom which was brilliant … you realise how much you can do with them and how much it can change your teaching as well" (2:100-104). Jenny's experiences with IWB during her professional experience were reminiscent of Katie's. One colleague teacher was struggling to turn the computer on and connect it to the IWB, whilst the second had activities set up for students to interact with. Jill's colleague teacher was confident using IWBs. Elizabeth gained little in the way of hands on IWB skills from her professional experiences, but did observe some of the interactive tools being used.

Technical issues that her colleague teachers could not fix prevented Julie from gaining experience with IWBs on any of her professional experiences. Alice's professional experience colleague teacher encouraged her to use the IWB however technical issues prevented it from working. The teacher was not able to assist, and commented that she had only had one professional learning session with it in two years. Likewise, Lisa did not have the opportunity to observe an IWB being used on one of her professional experiences because it was not in working order. On a different professional experience, Lisa observed her colleague teacher using it only as a data

projector screen for whole class teaching. Although Jeannine had planned a lesson using the IWB in the classroom, she had been forced to revert to a backup plan when she was unable to make the computer connect to the IWB. In this instance, Jeannine's colleague teacher was acting in a background supervisory capacity and was therefore not in a position to assist her.

Annie and Susan were in a different position compared with the other interviewees because they had been educated in using an IWB in a job prior to the commencement of their teaching degrees. As a result, Annie was able to help her colleague teacher to use an IWB whilst on professional experience. Whilst her teaching style was still developing, Susan was able to create interactive lessons for the students with whom she was working, and noted that "[UTAS] has engraved into [her] that technology has to be purposeful" (2:113).

5.2.9 Pre-Service Teachers' Experiences with IWBs as High School Students

Only ten of the 145 survey participants had experienced IWB use when they were a primary or high school student. Jill, an 18-25 year old pre-service teacher in her first year of study, had observed an IWB being used in her classroom when she was a high school student. However, the IWB had not been used in an interactive manner; when the teacher would try to show the class things by using the IWB as a screen for the data projector, her class had tended to "just look at our own screens or things, and look around, start talking, and not really be interested" (2:71-73).

5.2.10 Summary

Although 16 (89%) of the 18 pre-service teacher interviewees indicated that they expected to be using an IWB when they became a teacher, only half (9) of the pre-service teacher interviewees thought they were prepared to use an IWB as a teaching tool (see Table 5.2-1). Only one (5%) interviewee had received education in IWB use at university, and only four (22%) had seen an IWB used at university (see Section 5.2). In comparison, all interviewees saw an IWB being used during their professional experiences. However, only three (16%) of these pre-service teachers received specific IWB education during this time, mostly due to the lack of IWB skills of the colleague teachers, or lack of technical support (Table 5.2.7-1). Thus, the nature and extent of preparation of these pre-service teachers was erratic and

unstructured, with all interviewees indicating that they needed further education in IWB use.

5.3 Interview Data Related to Research Question 2

Research Question 2: *What is the nature and extent of IWB education received by teachers at a selected local Tasmanian primary school and how do they incorporate IWBs in their teaching practice?*

Of the two primary school survey participants, only one, Diane, consented to an interview. Diane was 51-60 years of age, had been teaching for 3 years, and had a permanent teaching position with the Department of Education at Sandbridge Primary School. Usually confident with technology, Diane had enjoyed having an IWB in her classroom for the past 2 years: "I hope I don't go anywhere where I don't have one!" (1:9). Diane said that she integrated her IWB into practically all of her lessons on a daily basis and considered herself to be competent at using it. Although a traditional whiteboard was also installed in her classroom, she rarely used it as she preferred using her IWB.

Initially Diane had been daunted by the installation of an IWB in her classroom. This changed dramatically when she received professional learning from an external expert coming to the school and working with the whole staff. Since then, she had not received any other external IWB education. However Sandbridge Primary School actively supported Diane's use of IWBs: "We all have one and we're all encouraged to use it" (2:60). The type of support had varied from whole staff discussions at staff meetings, to each staff member sharing an effective way that he or she had used their IWB that week, to demonstrating different skills "so that we can help each other learn in new areas" (2:67). In addition, Diane purchased the manual for her IWB software which she found to be very beneficial, however she had "found it hard to find time on [her] own to do it" (2:81). Diane also believed that her IWB skill development benefited from impromptu conversations with other teachers, discoveries made with students, and her own exploration of IWB tools. Whilst Diane thought she was using the IWB reasonably well, she would have liked to receive more professional learning: "it'd be really great just to extend and go up a level" (2: 88-89). Furthermore, to gain maximum benefit for student learning, Diane recommended that IWB education should occur each term.

Although there was an IWB on campus when Diane did her teacher education course at university, she had not learned how to use it at the time, and had not seen one being used. For current pre-service teachers, Diane thought that IWB education "should be compulsory because I would hate to come out and have to learn to teach as well as to learn to use the IWB as well" (4:175-176). Furthermore, Diane suggested that learning about an IWB should not be treated as a separate area, but should be embedded into each subject: "I wouldn't isolate it. If you isolate it, then you're not getting the benefit of it because IWBs aren't isolated work – they're a resource tool for every unit of work" (4:207-209). In recent years, Diane had supervised numerous pre-service teachers from UTAS during their professional experience. None of them had any experience with using an IWB before coming into Diane's classroom, but all were very pleased to have the opportunity to use one and see one being used, and were appreciative of her support and guidance in this regard. Diane noted that she thought it was easier for the technologically savvy pre-service teachers she had supervised to learn how to use it than it was for those who had been less experienced with technology. Furthermore, Diane thought that learning to use an IWB should be part of teacher education courses because they have "become very prevalent in most schools … I just think that you can't keep ignoring the fact that they are part of classroom culture" (5:229-231).

5.3.1 Summary

The primary school interviewee, Diane (Section 5.3) had received one IWB professional learning session with external experts when an IWB was installed into her classroom. Prior to this she had been concerned about the introduction of this new technology because she had not been exposed to one during her teacher education course. She recognised the need for more IWB education, so had sourced an IWB manual to further develop her skills. The school principal actively promoted IWB use through collegial discussion and sharing of IWB techniques, which Diane found beneficial. Furthermore, Diane acknowledged that she also learnt a lot from her students and her own exploration of the IWB. The IWB in her classroom had become an important tool that she integrated throughout her teaching on a daily basis. Although Diane had successfully developed her ability to use an IWB, she felt that she still required more IWB education to become a more effective user.

5.4 Interview Data Related to Research Question 3

Research Question 3: *What is the nature and extent of education regarding IWB use as a teaching tool received by UTAS Education teaching staff and how do they incorporate IWBs in their teaching practice?*

Of the 18 UTAS Faculty of Education teaching staff who participated in the survey, two staff members consented to an interview. These were Mark (5.4.1) and John (5.4.2). Neither of these staff members had received professional learning in using an IWB whilst at university; none of the four staff members who had received education in using an IWB consented to an interview. Their interview responses are presented in the following two sections.

5.4.1 Mark

Mark, a 26-30 year old male, had been contracted to the UTAS for the past 2 years and was usually confident with using technology. He did not think that the UTAS had actively encouraged the use of IWBs in his teaching and speculated that this was due to staff already needing to keep abreast of changes to online learning platforms. Nevertheless, he did believe that "it wouldn't be bad to have some more exposure, seeing that many schools … and their teachers currently use them in their practice" (1:12-13). Logistically, he thought it would be problematic to work out which courses/specialisations IWBs would be incorporated into and how it would be monitored.

Mark taught for 2 years at both primary and secondary level before teaching at university, and although he "did see them used for some basic interactive games and counting and that sort of thing" (6:287-288), his experience was very limited as they were either not in the school in which he was teaching, or his role did not involve them. Mark did not receive any education in IWB use during this time. IWBs were not part of Mark's own education at primary or secondary school because they did not exist at that point in time. IWBs had existed when he did his own teacher education course, but he had not seen one being used nor had he received any education in their use. He commented that it would have been useful seeing an IWB during the course because then he may have been able to "help teachers who might not have otherwise had exposure as well" (4:276-277).

Although Mark believed that IWB education would be beneficial for pre-service teachers, he believed that the teaching degree was focused on "teacher education, not just teacher training" (1:16-17). He felt that the role of university teaching staff was "to give people the skills to decide what technology will work and how they might consider its use, rather than giving them the skills to implement specific techniques" (1:17-19). Furthermore, Mark felt it was important that:

> we don't decide that IWBs are great so therefore I am going to teach with them … I think building pre-service teachers' understanding about what is available through IWBs will help them make decisions about whether this or that application is going to be useful for their context. (6:331-335)

Most of Mark's students studied via distance from areas across Tasmania and other states, which meant that they did not necessarily have access to an IWB on campus. In addition, Mark noted that if he were to embed IWB technology into tutorials, he:

> would have to be very clever about how we did that for online students … because the difficult thing is that we can expect that many students will see and probably use IWBs in schools but we can't guarantee it so we can't mandate it. So we can encourage it, but we can't require it. (1:46-40)

Some of the rooms in which Mark had taught at UTAS were equipped with an IWB whilst others were not. Mark had used an IWB on a few occasions in his teaching at UTAS, though "not extensively" (1:38), mostly utilising it as a screen for the data projector or for displaying students' work. He had not received any education in IWB use at UTAS, nor in his prior career, and he had not seen any other university staff members using one. However, he noted that on one occasion, UTAS administrative staff had tried to organise some IWB professional learning for staff, "but to find a time that would suit everybody was really difficult so I don't think many of us were able to take the opportunity because we were teaching at the time" (3:138-140). However, he felt that his teaching would benefit from IWB education as he had used it as not much more than a data projector screen:

> I think initially that exposure to the kinds of software and applications that are possible would be the most helpful … seeing what was possible, seeing the software and having that demonstrated. Even if I was just watching someone else teaching with it effectively would be good. (3:118-123)

If Mark was able to improve his IWB skills, he thought that "it would certainly change my delivery perhaps a little bit and I would certainly incorporate it more regularly into tutorials" (3:165-166). Mark also noted that the UTAS IT support technicians were always available to assist with technical issues or questions.

Mark did not think that schools expect pre-service teachers to be able to use an IWB before their professional experiences as he had not had any comments or complaints in this regard, "but then again, it could be just because I haven't been told" (2:112). Mark thought that the lack of expectation may be due to the wide variety of teachers' own capabilities with IWBs:

> Some teachers would be quite proficient and be exploratory in their use and embed it really well in their learning and teaching, but for others it might be something handy to watch a DVD … or just to have the projector. So I think that because not all teachers are using them to their maximum potential, then there is not a great expectation for beginning teachers. (2:85-89)

5.4.2 John

John, a 41-50 year old male, was on his first year of teaching secondment at UTAS and considered himself to be a confident user of technology. IWBs were not part of John's own education at primary, secondary, or university level because they did not exist then. Indeed, John noted that during his 'Technology Within' unit during his own teacher education, he had one week learning how to use an Apple 2C computer, and another "whole week devoted to chalk" (4:204). John had taught at primary school for 3 years, and secondary level for 6 years, prior to teaching at university. During this time he had occasionally used an IWB in his teaching.

As can be seen below in Table 5.4.2-1, John had used a fairly extensive range of IWB functions in his teaching pre-university. He learnt to use an IWB from an external expert coming to the school, by asking and watching colleagues, as well as learning through self-exploration and from his students. John had not used an IWB in his teaching at university because he had not had the opportunity to use one, nor did he feel that UTAS expected him too. He had not had any IWB education at UTAS because none was available to him. John did not believe he was a very effective IWB user as a teacher before his university career, and that he would need further IWB education before incorporating it into his teaching at UTAS.

Table 5.4.2-1
John's Use of IWB Functions as a Primary/Secondary School Teacher and at UTAS

Type of IWB Function	IWB Use as a Primary/Secondary Teacher	IWB Use as a University Lecturer
Data Projector	Yes	No
Preloading Teaching Pages	Yes	No
Dragging/hiding items	Yes	No
Display student work	Yes	No
Downloading images/sounds	Yes	No
Annotating displayed items	Yes	No
Revisiting materials	Yes	No
Digitally record interactive learning sequences	Yes	No
Movement/animation	Yes	No
Subject websites	Yes	No
Downloading from internet	Yes	No
Subject specific software	Yes	No
Search engine	Yes	No
Colour/shading/highlighting items	No	No
Saving Work	No	No
National curriculum materials	No	No

John felt that because IWBs had become so prevalent in schools, that in order "to make the university experience as practical as possible [lecturers at UTAS] need to be engaging with the resources and technology that pre-service teachers are going to see in the classrooms" (1:13-15). He did not think that UTAS was doing enough to prepare pre-service teachers to use IWBs and felt that it would be beneficial to pre-service teachers' preparation if better access to IWBs was provided:

> I think where our pre-service teachers are disadvantaged is that they are going into their prac situations and they haven't actually had any experience turning it on, manipulating it, setting it up, and finding things and organising things … basically using it as a resource. (3:164-167)

Furthermore, John had heard specific mention when he "was visiting students on prac, that they haven't had the experience of the IWBs that are so much a part of the primary school classrooms that they do their [professional experiences] in" (1:49-50). Indeed, John was aware of "concern by both students and staff that students perceive a difference between what they learn at university and what they learn on [professional experience]" (1:46-48). John believed that pre-service teachers did expect to gain practical experience with IWBs at UTAS, whereas he thought that perhaps university staff members did not have the same perception.

5.4.3 Summary

Neither of the university teaching staff interviewees had received education in IWB use during their career at university, although it should be noted that four staff had received IWB education but did not consent to an interview. IWBs did not exist when John did his own teacher education course, they did exist when Mark did his; however he had not received any IWB education, nor had he seen one being used. Neither of these staff members felt that they were actively encouraged to use an IWB in their teacher education courses. Mark had used an IWB minimally in his teaching practice, but not in an interactive manner. John had not used one at all in his teaching practice at university.

5.5 Interview Data Related to Research Question 4

Research Question 4: *What has influenced these pre-service teachers, primary school teachers, and UTAS Education teaching staff, with regard to their use of IWBs in their current teaching practice?*

This section reviews the interviewees' perceptions of each of the seven variables investigated. These are listed in Table 5.5-1 and were described in Chapter 3, Section 3.6.1.

Table 5.5-1
Variables Investigated with Sample Likert Statements in Surveys

Variable	Variable investigated
Variable 1:	Perceptions about the Usefulness of IWBs
Variable 2:	Participants' Attitude towards IWB use
Variable 3:	IWB Self-Efficacy
Variable 4:	Perceived Ease of Use of IWBs
Variable 5:	Perceptions regarding Technological Complexity of IWBs
Variable 6:	Facilitating Conditions for using IWBs
Variable 7:	Pedagogy

5.5.1 Variable 1 - Perceptions about the Usefulness of IWBs

All interview participants agreed that IWBs were a useful teaching tool. Of the 21 interviewees, only three pre-service teachers were unsure whether IWBs were suitable for their particular teaching area or not, with the remaining 18 participants indicating that IWB were suitable. However, both John and Mark, the university staff members, found it difficult to think of ways to use an IWB, as did two of the pre-service teachers. John, for example, preferred to teach without an IWB: "My focus is teaching and learning maths without pen and paper, without classrooms, and often without numbers" (3:131-132), hence using technology was not a focus. Neither primary school teacher Diane, nor the 16 pre-service teachers, had difficulty thinking of ways to use it. Mark did not think that using an IWB would improve his teaching, whereas John thought it would. Diane felt strongly that it would, as did 15 pre-service teachers; of the remaining three pre-service teachers, one disagreed and two were unsure. Both university teaching staff members and one of the pre-service teachers did not believe that knowing how to use an IWB would assist their careers; a further two pre-service teachers were unsure on this point. However Diane and the remaining 15 pre-service teachers felt it would assist their careers. From Katie's pre-service teacher perspective, "I think, as a new student coming out, we are competing with teachers that have a lot more experience … I feel like a new employer [from] the Department of Education is going to be weighing up teachers with more experience versus new teachers coming out, and the more skills we can show that we've got, the better chance we've got of being picked for a new position … As far as career

development and getting a job and a place when we come out, it is really, really important" (1:27-35). One pre-service teacher and both university staff members thought that IWBs were a passing fad; Mark felt that with the fast rate that technology changes, "they will be upgraded pretty quickly" (4:205). However Diane and 17 pre-service teachers did not. Diane commented that she didn't "think that [IWBs] are going to be a fad – they're too excellent of a resource tool. I can't imagine teaching without one. My observation is that wherever I go, the normal whiteboards are being taken out of the classroom … so I think that they're here to stay" (5:237-240).

5.5.2 Variable 2 - Participants' Attitude towards IWB use

University teaching staff members, John and Mark, both thought that there were better teaching tools than IWBs, and that IWBs were not an important teaching tool. Mark did not like using IWBs, whereas John was unsure, and both agreed (John strongly so) that IWBs were of no interest to them. However, Mark agreed that good IWB skills were an important component of teaching, whereas John did not. In comparison, primary school teacher Diane felt that IWBs were "an amazing tool" (1:26) and was far more positive in every respect in her attitude towards IWBs than the two university teaching staff members. Thirteen pre-service teachers also favoured using IWBs. Jeannine said she would love to use an IWB because they are "a fantastic educational tool for teachers and for students to learn and to improve learning" (1:8). Elizabeth was looking forward to using an IWB as a teacher, and Emily felt "excited about them" (1:8). Harry was very positive about IWBs; "an IWB combines my passion for teaching with my interest in technology. It is kind of a given that I really like it" (4:189-190). The remaining five indicated that they were unsure how they felt about using IWBs due to their limited experience in this area.

5.5.3 Variable 3 - IWB Self-Efficacy

Primary school teacher, Diane, was confident with using an IWB and self-rated her ability to use one as "fairly effective" (1:31). Neither Mark nor John, the university staff member interviewees, felt confident about their ability to use IWBs; IWBs made them feel nervous and uncomfortable, they felt frustrated by them and dreaded using them.

As can be seen in Figure 5.5.3-1, the pre-service teacher interviewees were evenly divided in their perceptions of their self-efficacy with using an IWB. Robyn was very confident in her ability to use IWBs, and described the way she learned new technologies as "almost like a natural process where we think, how can I do that, and we can work out how to do it" (4:187-188). Julie was confident enough to have a go at learning to use an IWB: "I'm not afraid to stuff up or mess up in front of the kids. I think it's really important for them to see we need to learn and that we don't have the answers and that maybe they do" (3:133-134). Julie acknowledged that she lacked IWB skills, and although she did not mind making mistakes in front of students, felt that "the problems [she] would encounter would slow the learning down significantly" (3: 136-137). Although generally confident and positive when using technology, Tina also felt IWBs were beyond her capability; she felt underprepared and incompetent with regard to using one. Neither Emily nor Maddy felt confident about using IWBs because they had not used or seen them used enough. When Susan first heard about IWBs, she was worried, but "once [she] saw it being used and [she] saw what the children could get out of it [she] was fine with it" (3:167-168).

Andrea's professional experiences highlighted for her how little both she and her teacher colleagues knew about IWBs, and how "desperately needed" (3:134) education in the use of IWBs was for pre-service teachers; one of her colleague teachers would not even turn the IWB on in her classroom. When Jeannine was on professional experience, she planned a lesson using her IWB, but her lack of skills in turning it on and getting it working meant she had to abandon her plan and resort to an alternative teaching method. During his practical experience, Harry observed his colleague teacher struggling with the technical side of IWB use, thus convincing him that IWB education for pre-service teachers was "essential" (2:89). Elizabeth said that her own limited understanding of IWB use and observations of teacher frustration in using one meant that she was "not prepared to go and turn [an IWB] on … I like the idea, but I'd need someone to show me how to do it" (2:107-108). She also noted that one of the units in her teacher education course had promoted the use of IWBs but offered no actual education in their use.

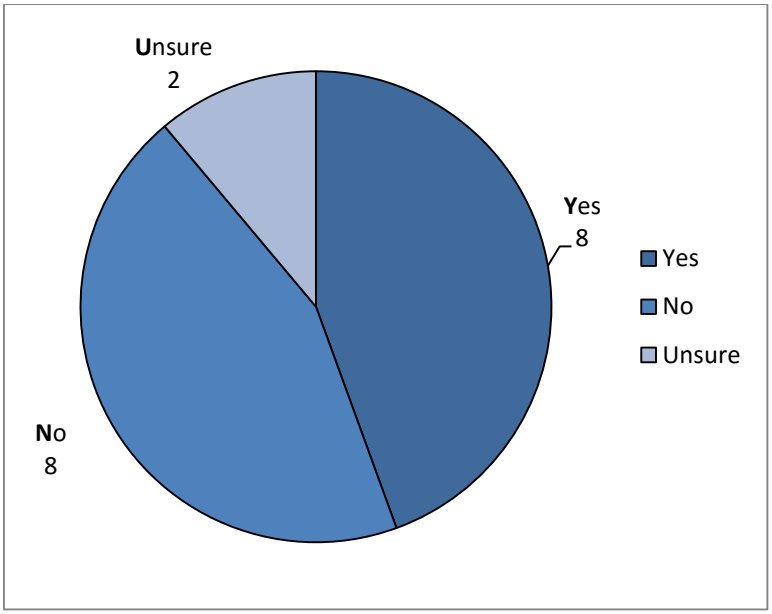

Figure 5.5.3-1. Self-Efficacy: Did Pre-Service Teacher Interviewees think they can Use an IWB?

5.5.4 Variable 4 - Perceived Ease of Use of IWBs

Primary school teacher, Diane, felt that IWBS were easy to use; she regularly used hers to "access files to pull up straight away to show the class. We can upload photos, we can upload work like writing, we can edit, we can upload things off the internet immediately" (1:17-20). Of the two university staff members, Mark was uncertain as to how easy or difficult IWBs were to use as a tool in his teaching, whilst John definitely thought they were difficult to use. In both Mark and John's opinions, IWBs were not worth the effort needed to use them and were too hard to bother with. Mark felt that the time it would require him to dedicate to become proficient with using an IWB would be excessive compared to the amount of time he would actually use it. He had used it as "little more than just a projector" (1:39), but felt that to move forward in his use, he would need to see how it could be used effectively and then develop the skills needed.

Pre-service teacher Maddy's view, that using IWBs were "quite difficult" (1:55) to use and that education in their use was vital, particularly for teachers who were not generally competent with using technology, was typical of the pre-service teachers. Further to this, Robyn's classroom experiences had shown her that with professional learning, IWBs were easy to use and navigate. IWBs had enabled her to "access a lot more information readily … you can have editing and drawing tools, you can use

internet content and games, you can import files such as photos and videos for the students to see, use and manipulate … You can save information, say you have a discussion or brainstorming session and record the students' ideas on the IWB, you can actually save and print that information" (2:81-87).

5.5.5 Variable 5 - Perceptions regarding Technological Complexity of IWBs

Neither of the university staff members, Mark or John, was perturbed by the technological complexity associated with IWBs. Both accepted the speed with which technology advances, as well as the need to keep learning; John in particular had enjoyed learning new technologies in the past. Primary school teacher, Diane, was also not concerned with the technological complexity of IWBs because she had developed an appreciation for them early on in her teaching career and was proactive in learning all she could about them.

Pre-service teachers had varying perceptions of the technological complexity of IWBs. Annie had overcome perceptions of IWB technological complexity by being proactive in seeking and undertaking professional learning in their use. Katie indicated that her perception of the complex nature of IWBs stemmed from her lack of professional learning and inexperience with IWBs and thought that there were probably many teachers in the same situation. Alice echoed this concern after discussions with one of her very experienced professional experience teacher colleagues explained that her avoidance of using the IWB in her classroom was due to it being too technically difficult due to a lack of education in its use. Marge had experienced and observed frustration with using an IWB due to a lack of professional learning and the consequent inability to trouble-shoot problems, noting that in this situation people tend to think, "Nope, too hard, I don't want to do it" (2:84). Similarly, Jill thought that rather than struggling to learn how to use an IWB she would be more inclined to use technologies she was familiar with, such as Apple TV and iPads.

5.5.6 Variable 6 - Facilitating Conditions for using IWBs

Diane, the primary school teacher interviewee, had received ongoing encouragement from her school to use the IWB in her classroom. An IWB was installed in all teachers' classrooms and the principal actively encouraged staff to share or show

examples of how they were using them, as well as new ways of using it that they had discovered. Professional learning had been provided when the IWBs were installed and ongoing IT support was available. Although Diane had not had access to peripheral items at the time of her interview, she had discussed plans with the IT support staff to link her iPad to her IWB.

Neither Mark nor John had received professional learning in the use of an IWB during their time teaching at UTAS. Mark did not think that the UTAS actively encouraged him to use an IWB in his teaching and he had not seen any other staff members using one. John was unsure whether the university actively encouraged his IWB use, but noted that he had not had the opportunity to use one because although there was an IWB on campus, it was not located where he taught. Hence, he felt it was inequitable as some staff had access to an IWB whilst others did not. He was not aware of any peripheral items available to him for use on an IWB, though appreciated the potential of additional devices. Mark noted that a workshop had been planned on the use of IWBs, but it did not work out as planned. Instead, some professional learning had been offered but the time it was available limited the number of staff able to attend. He had also experienced technological difficulties when he had attempted to use an IWB at UTAS, but felt that IT support was readily available provided enough advance notice was given. Mark also felt that it would be difficult to formalise which courses would include the teaching of IWB skills and that it would be necessary to consider equity for distance students who may not have access.

Education in the use of IWBs was not a compulsory part of the teacher education course at UTAS; only one pre-service teacher had received IWB education and this was attained whilst on professional experience. All 18 pre-service interviewees had seen an IWB in an educational setting. Twelve of the 18 pre-service interviewees had observed an IWB being used either during their teacher education course or whilst on professional experience. Only two pre-service teachers had used an IWB at UTAS during their teacher education course, with this use limited to interacting with a PowerPoint presentation, and only four had used an IWB whilst on professional experience. Three pre-service teachers, Robyn, Susan and Emily, had seen a peripheral item used in conjunction with an IWB, these being a microscope, a hovercam and an iPad respectively. Harry felt that the variety of different types of

software programs used on the IWBs he saw during his professional experiences was problematic.

All 18 pre-service teachers had observed issues with IWB use. The inability and lack of available assistance to trouble-shoot basic technical issues such as calibrating the IWB and pen, or being unable to connect the computer, IWB and projector, were very common problems. Poor skills and/or ineffectual or no use by colleague teachers during professional experience due to lack of ability was another very common issue. Slow internet speeds, blocked websites, and little or no support in fixing problems like a blown data projector light bulb, cabling issues, or adjusting the data projector focus were also reported. Emily noted that smaller schools have little access to IT support so "if you need help with your whiteboard then you may have to pack it away for a month as the support person only comes up once a fortnight" (3:144-146).

5.5.7 Variable 7 - Pedagogy

Diane enjoyed using technology in her primary school teaching role and described her teaching style as "very interactive" (1:44). She was confident using Easiteach software[1] and used a lot of visual cues for her students on her IWB. She was able to split her IWB screen in two halves in order to switch between teaching tools for multiple purposes, regardless of the subject. Saving, filing and retrieving student work on the IWB was standard daily practice for Diane, as was using multimedia resources and connecting to the internet. She gave examples of using her IWB as a resource tool, a teaching tool, and for student brainstorming. Her students expected to use it and they used it often; it was common for students to share a piece of work that the class would edit together. Diane integrated her IWB into practically every lesson on a daily basis, and never used a regular whiteboard; she considered IWBs to be a valuable "resource tool for every unit of work" (4:209).

University staff member, Mark, was confident using technology and appreciated the value of IWBs in a classroom, but thought that it was justifiable for universities to teach pre-service teachers the theory and skills for choosing the right technology for a task, rather than focusing on specific IWB education. He also believed that his teaching style would need to change a little bit if he were to effectively incorporate an

[1] Easiteach is an IWB software package that can be used interactively on any brand of IWB.

IWB into his tutorials; if he had more skills in using an IWB, he thought he would be able to adapt his pedagogy to suit. Mark had used an IWB as a medium for his students to present a lesson, and acknowledged the relevance and benefits of an IWB to his teaching area. He could see scope for a broader range of interactive lesson deliveries from both students and teacher if greater access to IWBs was available.

University staff member, John, liked using technology and thought that education in the use of IWBs should be part of teacher education courses, because IWBs were so commonplace, "we need to be engaging with the resources and technology that students are going to see in the classrooms" (1:13-14). However, he did not think that IWBs suited his teaching style as he tended to focus on practical, hands-on learning, although he acknowledged that there were virtual simulations that could be used to support his students' learning. He thought that there was "concern by both students and staff that students perceive a difference between what they learn at university and what they learn on prac" (1:46-48). Furthermore, he had also "heard it mentioned specifically when I was visiting students on prac, that they haven't had the experience of the IWB that are so much a part of the primary classroom" (1:46-50). Hence, he was concerned that the pre-service teachers are disadvantaged as "they are going into their prac situations and they haven't actually had any experience, turning it on, manipulating it, setting it up, and finding things and organising things" (3:164-167). John did not have ready access to an IWB at UTAS, and in his past teaching career, had mainly used an IWB as a projector screen with little use of its interactive features. He could envisage modelling IWB use by having students interacting in meaningful ways in his face-to-face classes and thought that his teaching would benefit from further development of his IWB skills.

All 18 pre-service teacher interviewees were very positive about the value of IWBs as a teaching tool in schools and all believed that they should be utilised at university for teacher education. In Julie's words, "I think it should be mandatory. I think while we learn a lot of theory and that might be quite useful, there are a lot of practical skills that aren't taught or modelled and integrating something like that into everyday teaching would assist teachers to then use them in their own practice" (1:21-24). All 18 interviewees also said that they needed further education in the use of IWBs. Of these pre-service teachers, 17 felt they needed to learn how to troubleshoot IWB

issues, 16 wanted to learn more about manipulating hands-on interactive features, 15 wanted to know more about locating and developing resources, and 13 wanted to learn more about the pedagogy associated with using an IWB. Emily, when considering her lack of experience and skill with using an IWB, said she felt "nervous about how [she would] find the time to learn them and maximise the usage and develop [her] knowledge before [she] becomes just another whiteboard type of teacher" (3:159-162). In comparison, Robyn felt that her teaching style suited the use of an IWB as she used an interactive and student-centred approach and was relatively confident in her IWB skills. All of the pre-service teacher interviewees felt that using an IWB would suit their teaching style and were very positive about using IWBs and technology in general, apart from Maddy. A self-professed technophobe and traditionalist, Maddy thought it to be unlikely that she would use an IWB in her teaching, but acknowledged that education in how to use one may influence her view in this regard.

5.5.8 Summary

Variable 1: Perceptions about the Usefulness of IWBs.

All the interview participants from all three participant groups thought that IWBs were a useful teaching tool. However, two pre-service teachers and both the university staff members found it difficult to think of ways to use them. The majority thought that an IWB would improve their teaching; one university staff member and one pre-service teacher disagreed.

Variable 2: Participants' Attitude towards IWB use.

The primary school teacher and 13 pre-service teacher interviewees had a positive attitude towards IWB use. The remaining five pre-service teachers were unsure due to their limited experience. Neither of the two university staff interviewees were interested in IWBs, nor did they consider IWBs to be an important tool.

Variable 3: IWB Self-Efficacy.

IWB self-efficacy was evident in the responses of the primary school teacher interviewee and approximately half of the pre-service teachers. Signs of IWB self-

efficacy were lacking in the responses of the university staff interviewees and approximately half of the pre-service teachers.

Variable 4: Perceived Ease of Use of IWBs.

The primary school teacher interviewee's responses indicated that she thought IWBs were easy to use. In contrast, one university staff member interviewee was unsure, and the other did not perceive IWBs to be easy to use. Overall, pre-service teacher interviewees indicated that IWBs were not easy to use, particularly for those who were relatively inexperienced with technology.

Variable 5: Perceptions regarding Technological Complexity of IWBs.

The primary school teacher interviewee was not concerned by the technological complexity of IWBs because she had developed an appreciation of their value as a teaching tool which had inspired her to keep improving her ability to use one. Neither university staff member interviewee was worried by the technologically complex nature of IWBs, however a mixed response was received from the pre-service teacher interviewees. This generally originated from the pre-service teachers' lack of IWB education as well as ineffective attempts (or lack thereof) by colleague teachers to use IWBs during professional experience.

Variable 6: Facilitating Conditions for Using IWBs.

The primary school teacher interviewee experienced supportive facilitating conditions for using an IWB at her school. She had constant access to an IWB, and the management had provided support and encouragement and set clear expectations for IWB use in classrooms. Technical support was available, and she had received some education in IWB use from external experts and had ongoing opportunities to learn from her peers.

The university staff interviewees' facilitating conditions were very different to those experienced by the primary school teacher. Limited IWB access was available, there was little managerial support and there was no expectation for IWB use in teacher education courses. Although technical support was available, education in IWB use had not been available for these staff members, possibly due to timetable clashes.

Pre-service teacher interviewees' facilitating conditions were similar to those experienced by the university staff members. Limited or no IWB access was available for the majority of these pre-service teachers. Although many pre-service teachers had an expectation to receive IWB education as part of their studies, this was not a reality for the vast majority. Education in IWB use could not be counted on during professional experience as it depended upon the school's facilities, technical support and colleague teacher's own level of IWB expertise.

Variable 7: Pedagogy.

The primary school teacher interviewee described her pedagogy as interactive and suited to using an IWB. As such, she found it easy to embed IWB into all her units of work for a variety of purposes. Neither university staff member interviewee thought their pedagogy suited the use of an IWB and acknowledged that it would need to change if they were to incorporate an IWB in their teacher education course. All the pre-service teacher interviewees thought that university staff should model IWB use as part of their teacher education course. All of these interviewees also indicated that they need more education in IWB use, with 13 specifically indicating they needed to learn more about the appropriate pedagogy for using an IWB.

5.6 Connections between Perceptions of the Pre-Service Teacher, University Staff and Primary School Teacher Interviewees Arising from the Interview Data

Analysis of interview data regarding Research Questions 1, 2, 3 and 4 identified five connecting themes. These themes were; the level and type of education in IWB use, access to IWB technology, technical support availability, expectations for IWB use, and level of pedagogical understanding. They are discussed in turn in Sections 5.6.1 to 5.6.5.

5.6.1 Level and Type of IWB Education Received

Although education in the use of IWBs was not embedded in the teacher education course, it was likely that pre-service teachers would observe an IWB being used whilst on a professional experience. Some pre-service teachers received IWB education whilst on professional experience; however the level and type of learning was heavily dependent upon the IWB skills and pedagogy of the colleague teacher, as

well as the IWB resources and support available in the school. It was possible for a pre-service teacher to complete his/her teacher education course without learning how to use an IWB, or even without seeing an IWB being used. The interviewed university staff members had not received any education in IWB use due to limited availability and lack of opportunity, nor had they seen other staff using one. The primary school teacher interviewee had not received any IWB education when she did her own teacher education at university. However, she had received one professional learning session provided by her school. It had been presented by experts from the company that had supplied the school's IWBs and gave a broad overview of its capabilities. Further learning was subsequently facilitated through the teaching staff openly sharing ideas and discoveries they or their students had made when using their IWB. The primary school teacher had also enhanced her own ability to use her IWB by purchasing and reading a manual dedicated to the Easiteach software that was installed on the computer attached to her IWB.

5.6.2 Access to IWB Technology

Access to IWB technology at UTAS varied greatly between pre-service teachers, and was particularly difficult for those who studied by distance. On numerous occasions, even when an IWB was in the classroom, it had not been used, or else it had been used only as a screen for a data projector. Access to IWB technology during professional experience also varied greatly for pre-service teachers as it depended upon the school and classroom allocation, each colleague teacher's IWB skill and pedagogy, and also the availability of IT support when technical issues occurred that were outside the colleague teacher's expertise. Access to IWB technology at UTAS also varied between university staff members. Access was limited to staff who were teaching in a classroom that was equipped with an IWB, which meant that some staff had not ever had access to one. The primary school staff member indicated that all classrooms in her school were equipped with an IWB, so access was not an issue.

5.6.3 Technical Support Availability

Pre-service teachers were unaware of technical support availability or issues with this at UTAS. However, the level of technical support available at different schools that pre-service teachers experienced whilst on professional experience varied greatly. Some colleague teachers had to wait for weeks for support, whereas others were able

to access support on site. Technical support was perceived to be readily available at UTAS for staff providing enough notice was given. Technical support had been available for the primary school teacher when she was planning ahead for using her iPad as a peripheral item on her IWB.

5.6.4 Expectations for IWB Use

Nearly all pre-service teachers expected to be using an IWB when they obtained a teaching position; however the expectations of pre-service teachers regarding IWB use at UTAS varied greatly. There was no formal requirement or mandate for pre-service teachers to learn how to use an IWB as part of his/her teacher education course, although most had anticipated that they would have the opportunity to use an IWB or see university staff modelling their use during their teacher education course. Most pre-service teachers who studied by distance did not expect to see an IWB used on campus. Most pre-service teachers, including those who studied by distance, expected an IWB to be used by colleague teachers and/or students whilst on professional experience. Some pre-service teachers felt they were expected to use an IWB whilst on professional experience whereas others did not. Some colleague teachers expected the pre-service teacher to use the classroom IWB, whilst others did not. University staff members did not believe there was an expectation for them to use an IWB in their teaching, nor that there was any expectation for them to teach students how to use one. Opposite opinions were expressed by the two staff members as to whether pre-service teachers expected them to use an IWB in their teaching, as well as regarding expectations about whether they were expected to teach pre-service teachers how to use one. The primary school teacher knew that she was expected by her principal to use an IWB in her teaching; she also knew that her students had the same expectation.

5.6.5 Pedagogy

All the pre-service teacher interviewees agreed that IWBs were a useful teaching tool and nearly all believed that their pedagogy aligned with its use, even though a number acknowledged that their pedagogical stance was still developing. Only one pre-service teacher thought her pedagogy was not suited to IWB use and attributed this to her disinclination to use technology and her preference for a more traditional teaching approach. Both university staff members felt their pedagogy would need to change,

one more so than the other, if they were to integrate an IWB into their tutorials. The primary school teacher thought her pedagogy was very well-suited to using an IWB and that she would struggle to teach without one as it was so ingrained into her classroom practice.

5.7 Summary

In this chapter, the interview participants were introduced and the interview data were examined in accordance with Research Questions 1, 2, 3 and 4. The five connecting themes arising from analysis of the interview data were also presented. Chapter 6 presents a discussion of the results of this study from which conclusions are drawn.

Chapter 6

DISCUSSION AND CONCLUSION

6.1 Introduction

The literature review relating to the research questions and the analyses of the survey and interview data have been examined in previous chapters. This chapter provides a summary of the study, followed by a discussion of the results of the study's findings in relation to each of the research questions in light of the literature review. Conclusions are then drawn and recommendations presented.

6.2 Overview of Study

The purpose of this research project was to investigate the nature and extent of education in IWB use gained by pre-service teachers enrolled in the Bachelor of Education course at UTAS. It sought to examine links between pre-service teachers' practical IWB skills, their self-efficacy with this technology, and their understanding of relevant pedagogy. Another aspect of this research project was focused on exploring the extent to which UTAS teaching staff used IWBs in their teacher course, as well as identifying influential factors on this use. Furthermore, it aimed to compare the nature and extent of pre-service teachers' education in IWB use with teaching practices in a Tasmanian primary school.

The study commenced with a literature review which, in addition to highlighting the value of IWBs in education, also suggested that a teacher's understanding of the pedagogical principles underpinning the use of IWBs, as well as his/her practical IWBs skills, may be contributing factors to the level of self-efficacy with which this technology is used (see Chapter 2).

The research methodology used a mixed method research approach, gathering both qualitative data from interviews and quantitative data using a survey that was initially tested with a pilot study (see Chapter 3). Overall, 165 participants chose to take part in the online survey, through which they could indicate their willingness to take a further part in the study by participating in an interview. All of the participants who were prepared to take part in the interviews were subsequently invited to do so, with 21 interviews subsequently conducted.

Analysis of the data gathered from the survey (Appendices E-G & L-O) was conducted, as was analysis of the interviews through careful reading and colour coding of responses, and the results were considered in accordance with each Research Question. This process also identified key differences and connecting themes between participants' responses. No significant differences were found relating to the responses of participants when analysed according to gender or age group (see Appendix L & M respectively).

In this chapter, the results of the survey data analysis are compared with and discussed in light of the results of the interviews, and connections are made with the literature discussed in Chapter 2. The chapter is structured in accordance with the four Research Questions.

6.3 Research Question 1

The first research question was:

What is the nature and extent of preparation of the pre-service teachers enrolled in the Bachelor of Education course at UTAS for using IWBs as a teaching tool?

Twelve (8%) of the 145 pre-service teachers reported receiving education in IWB use (see Chapter 4, Section 4.2), and 37 (25%) of the 145 pre-service teachers had seen an IWB being used (see Chapter 4, Figure 4.2-4). It is not surprising then that the pre-service teachers in this study overwhelmingly indicated that they would have liked IWBs to have been embedded into their teacher education course across the curriculum. Emily, the interviewee who reported receiving education in IWB use at university, noted that although minimal, she believed the IWB education she received had been worthwhile but that more was most certainly needed.

Half of the interview participants indicated that they felt that they were prepared to use an IWB when they obtained a teaching position and half did not (Chapter 5, Table 5.2-1). However, all of these participants indicated that further professional learning was needed for them to become proficient and effective users. Specifically, they felt they needed to know more about the interactive features, they needed a better understanding of the pedagogy associated with using an IWB, they wanted to be better at developing resources, and needed to know how to trouble-shoot common issues. This aligns with Guin and Trouche's (1998) description of instrumental

genesis, whereby the combination of tool, practical skills, and pedagogical understanding enables an individual to evolve and reflect upon the use of the tool in context. Furthermore, the development of different IWB skills is necessary for teachers to advance their ability to use an IWB effectively, and hence progress through the stages of use as described by Goodwin (2011) (Chapter 2, Section 2.6).

In addition to learning specific IWB skills and functions, pre-service teachers believed that their teaching would have benefitted greatly from seeing university teaching staff modelling different ways that IWBs could be used, as well as the range of pedagogical approaches that could be used to support their use. Unfortunately, the most common use of IWBs observed at university was its use as a screen for a data projector. Pre-service teachers are expected to develop the basis of their pedagogy during their teacher education course. Research suggests that IWB education should be introduced early in the course, rather than later, because the development of an interactive, student-centred, flexible and dynamic teaching style is vital for capitalising on the potential of this technology (Betcher & Lee, 2009; Campbell & Kent, 2010; Campbell & Martin, 2010). Indeed, five (28%) pre-service teacher interviewees specifically noted that their teaching style was still developing (see Harry, Section 5.2.3 & Tina, Section 5.2.4, for example), and nearly half (47%) were unsure whether their pedagogy suited IWB use or not. This response reflected comments made by Master of Teaching students in the pilot phase of this study (Chapter 3, Section 3.7); these students reported that their lack of pedagogical understanding of the use of IWBs impacted upon their ability to respond in an informed manner to aspects of the survey related to this area. A greater understanding of IWB pedagogy is clearly needed for many pre-service teachers. Those who thought their teaching style suited the use of an IWB indicated that they had an interactive and student-centred approach (see Robyn, Section 5.5.7, for example), which aligns with research (Betcher & Lee, 2009; Campbell & Kent, 2010; Campbell & Martin, 2010).

All the interviewees who studied by distance felt that education in the use of IWBs would have been beneficial to their preparation as a teacher (Chapter 5, Section 5.2.6). Although they acknowledged that it would not have been easy to achieve, they thought that professional learning could have been made possible through the use of

video tutorials available online, or by university staff creating and posting videos of themselves modelling IWB use or recording a regular tutorial in which they were using one and embedding it into the online unit resources. Other suggestions included setting assessment tasks that required pre-service teachers to create IWB-based learning activities, and setting assessment tasks that require pre-service teachers to video themselves using an IWB or a virtual alternative as a teaching tool. Although acknowledged as logistically difficult, making IWB education a compulsory part of professional experience for those who do not otherwise have access was also suggested and appears to have a great deal of merit.

There was little difference between the range of IWB functions observed by pre-service teachers who saw an IWB used at university compared with those for whom IWBs were part of their professional experience (Chapter 4, Table 4.2-2); the main difference was the variation in frequency of access (Chapter 4, Section 4.2). Most IWB use reported during professional experiences was by a colleague teacher or students in the classroom, with less than 27% of pre-service teachers using an IWB themselves (Chapter 5, Section 5.2.7). Approximately half of this IWB use was of an interactive nature. Observation of IWB use is worthwhile, but not as valuable to the learner as repeated hands-on guided experiences with dialogue supporting the development of pedagogy (Campbell & Kent, 2010, Chapter 2, Section 2.9). Another point of difference between pre-service teachers' observations of IWB use at university and during professional experience was the range of curriculum areas and ways in which the IWB was used; many more curriculum areas having IWB use incorporated were observed in primary school classrooms than was the case on campus.

Analysis of both survey and interview data showed that IWB technical issues were frequent during professional experience and, in many cases, caused a negative impact upon pre-service teachers' education in their use, which aligns with research findings (Beauchamp, 2004; Levy, 2002; Şad, 2012; Smith et al., 2005) (Chapter 2, Section 2.3). The results of Campbell and Kent's (2010) study highlighted the importance of teachers developing sufficient competence and technical skill if they were to become capable and proficient users of IWBs. In light of this, it is understandable that the majority of pre-service teachers indicated they needed to learn how to trouble shoot

IWB issues. Regardless, most pre-service teachers were very positive about the place of IWBs as a teaching tool, and nearly all believed they would be expected to use an IWB when they obtain a teaching position. This aligns with the idea of subjective norm (Ajzen, 1991), which Venkathesh and Davis (2000) indicated was particularly influential on the uptake of technology (Chapter 2, Section 2.9.7).

To achieve greater integration at university, the reasons for the lack of IWB use given by pre-service teachers (Chapter 4, Figure 4.2-1) would need to be addressed. Increased access to IWB technology is required to remedy the lack of available IWB technology which was the most commonly reported issue by pre-service teachers. Although this would require monetary expenditure, it is important because developing IWB competence is more likely to occur through regular (ideally daily), unrestricted access (Armstrong et al., 2005; Cuthell, 2003) (Chapter 2, Section 2.9.6). Improved access would also help alleviate the other reasons given by pre-service teachers for their lack of IWB use during their teacher education course. However, it would also require university teaching staff to employ a suitable pedagogy and have the skills to embed the IWB into both the teaching and assessment aspects of the units they taught so that pre-service teachers could not avoid or miss out on the opportunity to use an IWB. To achieve this, the provision of ongoing professional learning opportunities to fully develop teachers' ability to integrate IWBs into their teaching practice is needed (Armstrong et al., 2005). It is also vital that managerial support and the development of a culture that encourages the integration of technology is established (Campbell & Kent, 2010; Cheng et al., 2012; Groves & Zemel, 2000).

6.4 Research Question 2

The second research question was:

What is the nature and extent of IWB education received by teachers at a selected local Tasmanian primary school and how do they incorporate IWBs into their teaching practice?

The researcher acknowledges that the survey results for Tasmanian primary school teachers are not representative of the broader population of Tasmanian primary school teachers due to the very low number of participants (two) and the fact that they were from a single school. The data, therefore, should be treated with caution (Burns,

2000). Nevertheless, their cases are interesting, highlighting in particular the powerful influence of perceptions in technology use, and suggest a number of avenues for possible future research. Furthermore, this discussion draws on pertinent research gathered from three studies about the IWB experiences of primary school teachers in other parts of Australia (Chapter 2, Section 2.11).

Neither Diane nor Jane, the two Tasmanian primary school teachers who took part in the survey, had seen an IWB used when they were a primary or high school student, nor had they received education in IWB use during their teacher education course. Diane thought that such education would have been highly beneficial to her preparation as a teacher, positing that they should be part of each teacher education course as opposed to being presented as an isolated subject. Regarding current pre-service teachers, Diane strongly felt that education in the use of IWBs should be compulsory during their teacher education course because she thought it was challenging enough for new teachers when they first start teaching without needing to learn to use a new technology as well (Chapter 5, Section 5.3). Diane had supervised many pre-service teachers during their professional experience herself; although none of these pre-service teachers had had any prior IWB experience, all had been keen to learn about them. Minimal preparation in IWB use at university was also an issue raised by New South Wales primary school teachers in Maher et al.'s (2012) study (Chapter 2, Section 2.11.1). These teachers felt that their lack of education in both IWB use and pedagogical development was detrimental to their teaching practice. Similarly, the findings of Gregory's (2010) (Chapter 2, Section 2.10.3) Australian study indicated that proactive steps needed to be taken for pre-service teachers to develop effective IWB skills.

Both of the primary school teachers in this study indicated that they had received one formal professional learning session during their teaching career that had been provided by external experts coming to their school of employment. Australian research found that ongoing education in IWB use, with regard to both technical skills and pedagogy, was a key factor in developing teachers' ability to use an IWB increasingly effectively (Maher et al., 2012; Sweeney, 2008) (Chapter 2, Sections 2.11.1 & 2.11.2 respectively). The development of a school culture that encouraged ongoing collegial sharing of IWB learning was found to be an effective form of

professional learning in New South Wales primary schools (Maher et al., 2012, Chapter 2, Section 2.11.1). Professional learning was also considered necessary by the South Australian and Australian Capital Territory teachers in Sweeney's (2008) and Bennett and Lockyer's (2008) studies (Chapter 2, Sections 2.11.2 & 2.11.3 respectively). Furthermore, the use of a developmental framework for IWB use was found to be a useful tool for professional development (Sweeney, 2008) (Chapter 2, Section 2.11.2).

Diane and Jane had similar background experience with technology, neither professing to be particularly confident users of technology. Thus, it is interesting that, when compared to Jane, Diane's reported use of the IWB in her classroom was far more interactive, extensive and flexible, and capitalised far more on the potential of the IWB as a teaching tool. Diane's use aligned with the 'interaction' stage of IWB use as described by Goodwin (2011). In fact, because she had started to investigate how to use peripheral items with her IWB she was bordering on crossing to the highest 'advancement' stage of use. Diane associated many more benefits with using IWBs than did Jane, and integrated her IWB throughout her teaching program across the curriculum. She did not need or use a traditional whiteboard in her teaching and was prepared to extend her ability to use her IWB through exploration, learning from and with her students, and by sharing learning with her peers in both informal and formal contexts. Diane thought that her positive attitude and enthusiasm towards using IWBs was representative of approximately one-third of the teachers at her school.

In contrast, Jane generally used her IWB as a screen for her data projector to share a variety of resources, including those accessed through the internet. Unlike Diane, she did not use it to share student work or use the annotation function, nor did she use any of the interactive features or specialised software. Jane indicated that she had asked colleagues for help in using her IWB, and had also learnt from self-exploration and from her students, but she had not participated in sharing sessions regarding how IWBs were used with her peers. Jane's use aligned with the 'substitution' stage of IWB use as described by Goodwin (2011), verging on crossing to the 'accommodation' stage.

The teachers in the Australian studies discussed in Section 2.11, were reported to have had different confidence levels and background experiences with technology. Their IWB use appeared to align with the 'substitution' and/or 'accommodation' stage, as described by Goodwin (2011). The New South Wales teachers in Maher et al.'s (2012) (Chapter 2, Section 2.11.1) study used some of the more basic features of IWB software, but not the more advanced uses, with extremely limited peripheral items used in conjunction with IWBs. The four teachers in Bennet and Lockyer's (2008) study (Chapter 2, Section 2.11.3), each integrated IWBs into their teaching at different levels and in different ways. The development of confidence was deemed an important requirement to advancement through stages of IWB use (Sweeney, 2008) (Chapter 2, Section 2.11.2).

Diane was far more positive overall in her acceptance of IWBs in relation to all seven of the variables investigating teacher perceptions related to IWB use than was Jane. This difference in attitude is important to note because research has shown that it can have a significant effect on how teachers use technology (Glover & Miller, 2001; Grainger & Tolhurst, 2005; Kutluca, 2010). Indeed, as reported in Chapter 2, research suggests that the more positive the attitude, the more effective the use of the IWB will be (Glover & Miller, 2001; Way et al., 2009). Diane perceived IWBs to be a more useful teaching tool than did Jane; this difference in perception is a concern because, as Armstrong et al. (2005) noted, the interactivity of an IWB may be lost when a teacher does not appreciate the usefulness of an IWB. The teachers in Bennet and Lockyer's (2008) study (Chapter 2, Section 2.11.3) had volunteered to take part in an IWB integration trial, hence were predisposed to being positive and enthusiastic in their uptake of the technology. In comparison, the teachers in Maher et al.'s (2012) study (Chapter 2, Section 2.11.1) had greater disparity in their attitude towards and acceptance of IWBs. The teachers in Sweeney's (2008) study (Chapter 2, Section 2.11.2) needed supportive leadership to maintain their initial enthusiasm.

Jane thought that IWB technology was more complex and less easy to use than did Diane. Jane also had a greater expectation of experiencing difficulty in coping with technological issues, than did Diane. These differences, combined with the fact that Diane's IWB use was far more advanced and extensive than was Jane's, aligned with the multitude of research cited in Chapter 2 (Lin & Lu, 2000; Park, 2009; Teo, 2009;

Thompson et al., 1991; Thong et al., 2002), that found that perceptions regarding how easy technology is to use are generally reduced when greater technological complexity is perceived. Research also suggested that it would not be surprising for Jane to choose to not use her IWB if there was an alternative option that she perceived to be easier (Davis, 1989). Perceived ease of use of IWB technology and associated resources was found to be an influential factor on the IWB use of the New South Wales teachers in Maher et al.'s (2012) study (Chapter 2, Section 2.11.1). Diane was more self-assured with regard to her IWB skills than was Jane; this would most likely have contributed to the different ways these teachers used their IWBs because strong self-efficacy promotes the application of skills and increases the likelihood of success (Bandura, 1997). According to Beauchamp (2004), teacher confidence with technology is an essential prerequisite for using an IWB; again, it is not surprising that Jane's use of IWBs was less developed than Diane's because she was less confident in her skills. Rosenfeld and Martinez-Pons (2005) suggested that older teachers may not be as technically capable as younger teachers; this is not the case in this instance, because Diane was older than Jane. McCoy (2010) suggested that younger respondents held higher levels of self-efficacy that may be explained by broader experience with different technologies. However, this also does not appear to be the case in this instance as both Jane and Diane reported similar prior experience and computer access. Furthermore, Jane had in fact had access to a computer at home for longer than Diane, although Diane's experience with different software applications was broader than Jane's.

Research has shown that supportive facilitating conditions are important to effective IWB use (Campbell & Kent, 2010; Cheng et al., 2012; Compeau & Higgins, 1995; Glover & Miller, 2002b; Kennewell, 2005; Ngai et al., 2007; Teo, 2009; Teo & Noyes, 2011; Thompson et al., 1991). Despite the fact that Diane and Jane were employed at the same school, Diane's responses indicated that she perceived a higher level of support in using an IWB overall than did Jane. Whilst both teachers agreed that IWBs could be unreliable, Diane indicated that support was readily available to her in her school, but Jane did not. Technical support was identified by Campbell and Kent (2010), Cheng et al. (2012), and Groves and Zemel (2000), as one of the most crucial factors that influences a teacher's use of technology. However, Jane and Diane's responses indicated that it may not so much be the actual availability of

support, but teachers' perceptions of the availability of support that matters. This situation is consistent with the findings of Robey (1979) and Teo (2009), both of whom identified a direct link between the perceived level of support and utilisation of technology. Both teachers had open access to an IWB because one was installed in each of their classrooms, which means that inconsistencies in ease of access, as noted by Grainger and Tolhurst (2005) and Slaouti and Barton (2007), were not a contributing factor to the difference in their level of use. According to Diane, the school principal was supportive of all teaching staff members' use of IWBs and encouraged collegial sharing across the school. Such managerial support was identified as exerting a vital and positive influence on a teacher's self-efficacy (Compeau & Higgins, 1995) and acceptance of technology (Campbell & Kent, 2010; Cheng et al., 2012; Groves & Zemel, 2000). However, unlike Diane, Jane indicated that she had not seen how other staff used an IWB and had not participated in peer sharing sessions. This may account for the differences evident in these two teachers' IWB use, and aligns with research that suggests that the observation and sharing of IWB skills is beneficial to the development of both IWB skills and appropriate pedagogy (Grainger & Tolhurst, 2005; Sweeney, 2008). Nearly all the teachers in the three Australian studies examined in Chapter 2 (Section 2.11) had IWBs installed in their classrooms; the additional provision of teacher laptops equipped with IWB software was also found to be beneficial to teacher development (Sweeney, 2008, Section 2.11.2). School leadership that encouraged IWB use was important to the development of IWB skills was found to be very influential in Maher et al.'s (2012) study (Section 2.11.1).

Although Diane's responses indicated that the staff at her school were encouraged to share their IWB learning with their peers, an approach strongly recommend by numerous researchers (e.g., Campbell & Kent, 2010; Cheng, et al., 2012; Gore et al., 2004; Kennewell, 2005; McRae et al., 2000; Polly, 2011), the school had provided only one professional learning session whereby external experts came to the school to work with staff. Overwhelming research (Benton Foundation, 1997; Glover & Miller, 2002b; Kennewell, 2005) providing evidence of the importance of ongoing professional learning for developing teachers' ability to integrate IWBs into their teaching practice was presented in the Literature Review (Chapter 2, Section 2.9.6.4). Ongoing professional learning, as recommended by Diane, may have had a positive

impact on Jane's IWB use. It may also have increased Jane's self-efficacy with this technology by increasing her understanding of how to capitalise on it as teaching tool, both pedagogically and practically, as well as how to trouble-shoot common issues she was experiencing. Glover and Miller (2002b) stressed that teachers need to be convinced of the value of an IWB if they are to genuinely commit their time and effort learning how to use them effectively. Diane had a sound understanding of how to use an IWB as well as the appropriate pedagogy to support its use, yet she recognised that her skills still could be improved and expressed the desire to continue to do so. This aligns with the progression of teachers through the stages of IWB use, as described by Goodwin (2011) (Chapter 2, Section 2.6), whereby ongoing professional learning can be used to support the development of IWB skills and pedagogy, thus enhancing the effectiveness of teachers' IWB use. The findings of all three Australian studies examined in Chapter 2, Section 2.11, indicated that ongoing professional learning was vital in the continual development of IWBs skills, particularly through the more advanced, complex stages. However, Maher et al. (2012) (Chapter 2, Section 2.11.1) noted that some staff avoided such learning opportunities, which is cause for concern as it is detrimental to the advancement of IWB teaching skills for both those staff, and those who could learn from them.

With regard to IWB pedagogy, comparison of responses indicated that Diane's approach was very interactive and complemented effective IWB use, whereas Jane's did not. It is evident from comparing the ways in which Diane and Jane used their IWBs that a teacher's pedagogy has an impact on how effectively and how often an IWB is used, which aligns with the research of Campbell and Kent (2010). This comparison also supports Betcher and Lee's (2009) opinion that the real challenge for teachers is to develop capacity for, and understanding of, the pedagogy needed for using the technology in dynamic and interactive ways. Pedagogical development was also found to be intricately linked with the advancement of IWB skill and effective use of IWBs in other primary schools in Australia (Bennet & Lockyer, 2008; Maher et al., 2012; Sweeney, 2008) (Chapter 2, Sections 2.11.2, 2.11.1 & 2.11.2 respectively). It would seem that professional learning in the use of IWBs helps facilitate more effective and more frequent use of IWBs; although it clearly needs to be ongoing, it does not necessarily have to be from external experts coming to a school if there is adequate expertise and enthusiasm and the learning community is supportive. These

findings align with the findings of the three Australian studies reviewed in Chapter 2 (Section 2.11). It would appear that the findings of Beauchamp (2004) are relevant to this study, in that the development of a teacher's ability to troubleshoot basic IWB issues is crucial for developing their IWB skills. When all of these conditions are met, IWBs are more likely to be integrated into everyday teaching practice in flexible and increasingly effective ways.

6.5 Research Question 3

The third research question was:

What is the nature and extent of education regarding IWB use as a teaching tool received by UTAS Education teaching staff and how do they incorporate IWBs in their teaching practice?

Of the 18 university staff members who chose to respond to the survey, eight (44%) believed they were capable of using an IWB effectively as a teaching tool. However, only four (22%) had received education in IWB use whilst employed at university; the remainder (56%) indicated that IWB professional learning had not been available for a variety of reasons (see Chapter 4, Section 4.4). Ten (55%) respondents indicated they needed more professional learning in using an IWB before they could use one effectively. Only two (13%) university staff members thought that their teaching style would not need to change for them to use an IWB effectively. Three (17%) respondents had developed their skills through professional learning they had received during their teaching career pre-university employment, and one (5%) had developed his understanding of IWB use through seeing an IWB used extensively during his high school years, and through observations made when visiting pre-service teachers who were on professional experience in primary school classrooms.

There was virtually no difference in the type of IWB skills learned by staff who received education in their use either at university or pre-university (see Chapter 4, Table 4.4-1). The most commonly learnt skills were trouble-shooting common IWB issues, and learning to use IWB software programs and associated tools, all of which have been identified as skills necessary for effective IWB use (Goodwin, 2011; Sparrgrove, 2009). Only three (17%) people reported having had the opportunity to learn about pedagogical approaches for using an IWB. This is a concern because

research (Betcher & Lee, 2009; Campbell & Kent, 2010) has identified this understanding as vital for capitalising on the potential of IWBs, and must be developed if teachers are to progress through the stages of IWB use, as described by Goodwin (2011) (see Chapter 2, Section 2.6).

Interestingly, only four (22%) of the 18 university staff member survey respondents believed that there was an expectation for them to use an IWB in their teaching, despite the fact most staff acknowledged that technical support was readily available, and more than half had seen other staff members using an IWB. The remaining 14 (78%) staff members held the perception that IWB use was not an expected behaviour for their teaching role, and hence the subjective norm was lacking in extrinsic motivation for IWB use as it was not perceived to be viewed as valued or important by the governing organisation (Bandura, 1986; Bill, 2003; Cheng, et al., 2012; Teo, 2011) (see Chapter 2, Section 2.9.7). Two (11%) staff members indicated that they had consistent access to an IWB when they were teaching. Most staff did not feel supported by the university in using an IWB in their teaching; this was mostly due to the lack of regular access to the technology. The unavailability of support perceived by university staff was also likely to have contributed to their lack of IWB use, for as research suggested, if the facilitating conditions are unfavourable, technology is less likely to be used (Armstrong et al., 2005; Cuthell, 2003; Glover & Miller, 2002a; Thompson et al., 1991) (Chapter 2, Section 2.9.6).

Seventeen (95%) of the university staff member survey participants identified positive attributes of using IWBs as a teaching tool; only one thought that IWBs were completely useless, a waste of time and effort, and a passing fad. Interviewee UTAS staff member Mark thought that IWB technology was likely to be upgraded relatively quickly (Chapter 5, Section 5.5.21). The evolution of IWBs is underway with the introduction of eBoards and interactive flat panel displays (Chapter 2, Section 2.2); however, the numbers of interactive display technology are continuing to increase in classrooms worldwide and have been doing so for over 20 years (Futuresource Consulting, 2014) (Chapter 2, Section 2.3). Perceived usefulness of technology was one of the determining factors identified by Davis (1985) in his widely recognised Technology Acceptance Model, as discussed in Chapter 2 (Section 2.8). To change the perceptions of technology users with a negative view of the value of IWBs,

Sparrgrove's (2009) research indicated that careful modelling of the many benefits of using an IWB for both teachers and students should gradually be introduced. In this way, they have the opportunity to develop an understanding of the value of IWBs so that they are more inclined to invest time and energy into learning how to use one (Chapter 2, Section 2.9.1).

None of the 18 university staff survey respondents had received education in using an IWB during their own teacher education course (Chapter 4, Section 4.4). This lack of exposure to IWBs may have contributed to the limited use of IWBs by the majority, as reported by pre-service teachers (Chapter 4, Section 4.2), because they would not have had the opportunity to develop their IWB skills or associated pedagogical understanding at this time. For approximately half of the university staff, the lack of IWB experience in their own initial teacher education was due simply to the fact that IWBs did not exist when they did their course. For the remainder, this was a lost opportunity; as research showed, teacher education courses should include tools and experiences that are beneficial for teachers (Teo, 2009) (see Chapter 2, Section 2.9). Although this potential source of learning did not contribute to the development of these particular university staff members' IWB education, there is a strong argument to be made for teacher education courses to include education in IWB use so that future university teaching staff members may be better prepared. Campbell and Kent (2010) suggested that the poor use of IWBs observed by pre-service teachers during their professional experience could set a pattern for poor use by pre-service teachers when they graduate (Chapter 2, Section 2.10.5). Similarly, it is possible that the lack of positive role modelling in IWB use experienced by these staff members during their own teacher education course has created a cyclic situation which must be broken. Indeed, one of the university interview participants commented that IWB education would have been useful to him for several reasons. Firstly, it would have helped him in his teaching. Secondly, he would have been in a position to help other staff members who did not know how to use an IWB. Thirdly, he thought it was of the utmost importance that the university experience equips pre-service teachers with the skills, knowledge and understanding to make choices about what technology would be the best for their chosen learning experience, thus making exposure to IWBs through his teaching beneficial.

Approximately one-quarter of the university staff participants thought that education in IWB use would most likely influence their pedagogy. Four (22%) included optional additional information pertaining to expectations of IWB use at university; they thought that there was an expectation by pre-service teachers that university teaching staff would teach and/or model the use of IWBs for them (Chapter 4, Section 4.4). Further to this, when visiting pre-service teachers during their professional experience, one of the university staff interview participants had heard specific concerns raised by pre-service teachers about their lack of IWB skills. The second university staff interview participant acknowledged that such concerns may have existed, but if they did, they had not been brought to his attention. Although some university staff viewed their role as providing pre-service teachers with an understanding of how to select and integrate technology in meaningful ways, providing more explicit teaching of IWB technology was not viewed as a priority.

When asked to provide an example of effective use of an IWB as a teaching tool, all university staff member survey respondents provided mostly student-centred, interactive examples of integrating it into learning experiences. When asked to provide an example of poor use of an IWB as a teaching tool, these same respondents provided appropriate, non-interactive examples that were generally focused on using the IWB merely as a screen for a data projector. From these responses, it was evident that the university staff members understood the interactive nature of the teaching tool. Despite this understanding, analysis of the staff members' responses who indicated they had attempted to use an IWB in their teaching at university revealed that using the IWB as a data projector (non-interactively) was by far the most common application (Chapter 4, Table 4.4-3), which is indicative of Goodwin's (2011) first stage of IWB use, substitution (Chapter 2, Section 2.5.1).

There were four instances in which staff indicated that they had used some of the interactive features afforded by IWBs, such as dragging or hiding items and using internet resources, which are traits indicative of Goodwin's (2011) second stage of IWB use, accommodation (Chapter 2, Section 2.6.2). These same staff also used the IWB to display students' work, annotate items, and digitally record interactive learning sequences, all of which are indicative of higher competencies IWB usage, bordering between the third and fourth stages of Goodwin's framework, these being

exploration and interaction respectively (Sections 2.6.3 & 2.6.4). The four staff members who received IWB education whilst employed at university had progressed through more stages of IWB use than the majority of their counterparts. Fiona's use of IWBs was the most advanced of the university respondents and reflected her more extensive education in IWB use (Chapter 4, Section 4.4). Fiona was operating between Goodwin's three most advanced stages, exploration, interaction and advancement. It is reasonable to conclude that the combination of her constant access to an IWB, her belief that she was adept in its use and expected to use the IWB, as well as the extensive education in IWB use that she had received, had supported her progress.

It would appear that having an understanding of the nature and potential offered by IWBs is not enough. The pedagogical understanding has to be accompanied by the appropriate technological skills for IWB use to be effective.

6.6 Research Question 4

The fourth research question was:

What has influenced these pre-service teachers, primary school teachers, and UTAS Education teaching staff, with regard to their use of IWBs in their current teaching practice?

All seven of the variables identified in the literature were found to have been influential for the participants in this study. They are discussed in turn in relation to this study in the following sections.

6.6.1 Variable 1 – Perceptions about the Usefulness of IWBs

Statistically significant differences were found relating to the responses of pre-service teachers and university staff to seven of the eight statements investigating their Perceptions about the Usefulness of IWBs. Overall, it was found that pre-service teachers perceived IWBs to be a more useful teaching tool than did university staff (Chapter 4, Table 4.5.1-1), as did the primary school teachers (Chapter 4, Table 4.5.1-3). This may partially have been due to the participants' differing perceptions of the subjective norm (Ajzen, 1991) (Chapter 2, Section 2.9.7). Both primary school teachers thought IWBs were a useful teaching tool, although one was noticeably more

positive about this than the other. Overall, the pre-service teachers and primary school teaching staff perceived IWBs to be far more useful as a teaching tool than did university staff; in fact, the statistically significant difference between the two means indicated that university staff did not perceive IWBs to be a useful teaching tool, whereas pre-service teachers very strongly did. Of note was the wide diversity of responses from university staff respondents, indicating that some staff had more positive perceptions about the usefulness than did others. However, university staff members' responses to Likert Statement 1 in Table 4.5.1-1 (Chapter 4), 'An IWB is a useful teaching tool', attracted a mean score of 1.78, indicating that IWBs were not a useful teaching tool. This was the most negative response of all the mean responses to any of the 56 statements. Only one (6%) university staff member perceived IWBs to be useful, two (13%) were unsure, nine (56%) disagreed that IWBs were useful, and four (25%) strongly disagreed that IWBs were a useful teaching tool (Chapter 4, Table 4.5.1-2). This perception is perhaps understandable in light of research that suggests people who perceive technology to be useful and believe that it will enhance their ability to do their job are more likely to use the technology than those who do not (Davis et al., 1989; Robey, 1979; Zevenbergen & Lerman, 2008). This research also explains the interesting findings, that university staff did not perceive proficiency with an IWB to assist their career. One explanation provided by a staff member for his response was that his teaching load was mostly online and he did not feel that IWBs suited this environment. He also felt that the amount of time he perceived that would be required to become proficient with an IWB and maintain this level of proficiency was too great compared to the limited number of hours he taught pre-service teachers on campus. Furthermore, there was no expectation from the university for staff to use IWBs in their teaching.

The pre-service teacher and primary school teacher interviewees thought that IWB skills would be particularly advantageous for them when seeking employment. They also thought that IWB skills would be beneficial to their teaching, whereas the two university staff interviewees also indicated that they found it difficult to think of ways to use an IWB in their teaching. It should be noted that there were fundamental differences between the roles and expectations of university teaching staff and primary school teachers. Most UTAS staff also had research as part of their role; promotion was dependent upon this research as well as teaching, with the latter

measured in particular ways. Change would require reprioritisation of teaching and of the role of technology within teaching by the university, thus changing the existing subjective norm (Ajzen, 1991). Such change would have the potential to exert extrinsic motivation on the use of IWB technology (Cheng, et al., 2012). Furthermore, to change the perceptions of the university staff who did not view IWBs as useful, research indicated that gradual exposure to the benefits of IWBs (Sparrgrove, 2009) and sustained access and ongoing support would be needed (Armstrong et al., 2005; Cuthell, 2003).

6.6.2 Variable 2 - Attitude towards IWB Use

Pre-service teachers were more positive than university staff regarding their attitude towards IWB use; indeed, statistically significant differences were evident between pre-service teachers and university staff in relation to all eight Likert statements relating to this variable (Chapter 4, Table 4.5.2-1). However some university staff responses were more negative in attitude than others, hence a wide standard of deviation was evident across their responses. This is important to note because at first glance at Table 4.5.2-1, it could appear that all university staff members do not like using an IWB or do not think IWBs are an important teaching tool, however this is not necessarily true of all staff members. Interestingly, only two (2%) pre-service teacher survey participants indicated that they did not like using an IWB, compared to three (19%) university staff participants, whilst 33 (27%) pre-service teachers and eight (50%) university staff were unsure. This is concerning because research has shown that a negative attitude towards technology has the potential to result in apprehensive behaviour, lower confidence, and a tendency towards traditional teaching methods (Glover & Miller, 2001; Grainger & Tolhurst, 2005; Kutluca, 2010). Both primary school teachers recorded positive attitudes towards IWB use, although one teacher (Diane) was more positive than the other (Jane). Although this difference in attitude was slight, it was echoed in many aspects of these teachers' responses throughout the survey, and, importantly, was reflected in the higher number of ways that Diane used her IWB compared to Jane. However, this is not surprising as research (e.g. Glover & Miller, 2001; Way et al., 2009) has strongly suggested that a teacher's attitude towards technology can impact on how they use the technology in their teaching role. Way et al. (2009) have also found that a positive attitude towards using IWBs enhances a teacher's ability to capitalise on their creativity, which is

beneficial to moving through the stages of Goodwin's (2011) stages of IWB use, and which ultimately benefits student learning.

6.6.3 Variable 3 – IWB Self-Efficacy

Overall, the survey analysis revealed that pre-service teachers' responses demonstrated greater self-efficacy with IWB technology than did the responses of university staff; statistically significant differences were found with five of the eight statements investigating this variable (Section 4.5.3). Pre-service teachers were more confident in their existing IWBs skills, as well as their ability to learn to use an IWB if help was available in times of trouble, than were university teaching staff. However, disparity of opinion was evident within both participant groups as each had a wide standard deviation range (Table 4.5.3-1). There were also a considerable number of pre-service teachers who were unsure of how confident they were using an IWB because they had not ever actually used one. Disparity of opinion was also evident in the primary school teachers' responses as one teacher felt far more confident using IWBs than the other. There were seven (6%) pre-service teachers and two (13%) university staff members who thought they could not learn to use an IWB if someone showed them how to do it first (Section 4.5.3). On average, pre-service teachers and university staff thought they could learn to use an IWB if someone showed them how to do if first, although both participant groups had a reasonably wide standard deviation. It is important for education faculties to take steps to offer assistance to staff and pre-service teachers who do not have confidence in their technological abilities, because teacher confidence has been identified as an essential prerequisite for using IWBs (Beauchamp, 2004). Low self-efficacy has the potential to undermine the efforts of anyone attempting to use an IWB because self-doubt can engender lower levels of persistence and poorer motivation, thus weakening existing skills and stunting further development (Compeau & Higgins, 1995; Teo, 2009). Thus, if the status quo remains, it is more likely that pre-service teachers and university staff with low self-efficacy will struggle to adapt to using an IWB and subsequently be slower to progress through Goodwin's (2011) stages of IWB use than those with stronger self-efficacy. Research shows that with adequate professional learning and a supportive environment that highlights the benefits of using the technology, it is possible for those with low self-efficacy regarding IWB use to become effective users (Gülseçen & Kubat, 2006).

6.6.4 Variable 4 – Perceived Ease of Use of IWBs

Pre-service teachers perceived greater ease of use with regard to IWBs than did university staff members for four of the eight Likert statements investigating this variable. Only 64 (53%) pre-service teachers and six (38%) university staff strongly agreed/agreed that IWBs were easy to use. Research (Davis et al., 1989; Sparrgrove, 2009) indicated that this may be due to perceptions about IWBs being technologically complex, thus making it seem that an excessive effort is needed to successfully use one, and making an alternative option more attractive. However, only five (3%) of the entire population of participants in this project thought that IWBs were too hard to bother with; this figure comprised four pre-service teachers and one university staff member (Chapter 4, Table 4.5.2-2).

Primary school teacher interviewee, Diane, provided indepth, spontaneous examples that clearly demonstrated the ease and well-developed ways in which she was able to use IWB technology (Chapter 5, Section 5.5.4). Her colleague, Jane, did not perceive IWBs as easy to use, however she still considered them to be worth learning to use (Chapter 4, Table 4.5.4-3). In comparison, both Mark and John, the two university staff member interviewees, thought that in their teaching role, IWBs were not worth the effort needed to learn to use them (Section 5.5.4); in fact, one third of university survey participants were of this same opinion (Chapter 4, Table 4.5.4-2). One of the pre-service teacher interviewees, Robyn thought IWBs were very easy to use and readily provided numerous examples, crediting her positive perception of using IWBs to the professional learning she had received in classrooms (Section 4.2.7.2). Another pre-service teacher interviewee who thought IWBs were difficult to use, suggested that education in their use was vital for teachers like herself, who were not very comfortable using technology (Section 5.2.6). With ongoing support and education in IWB use, research (Davis et al., 1989; Sparrgrove, 2009) indicates that perceptions associated with IWBs being difficult to use can be overcome. Indeed, if a learner believes that the benefits outweigh the difficulties they associate with IWBs, the difficulties can also be mitigated; hence, it is important that the potential benefits of using an IWB are explicitly included in professional learning sessions (Smith, 2000).

6.6.5 Variable 5 – Perceptions regarding Technological Complexity of IWBs

Overall, university staff members perceived IWBs to be more technologically complex than did pre-service teachers, with analysis of four of the eight statements

producing statistically significant average responses for both groups (Table 4.5.5-1). Overall, pre-service teachers were less concerned by all aspects of technological complexity investigated than were university staff members; however there was a wide standard deviation with regard to the university staff's responses to all eight statements. Whilst this is an area of concern as it is clearly an issue for some of these staff members, technological complexity was not a concern for either of the two university staff member interviewees (Chapter 5, Section 5.4). Primary school teacher interviewee, Diane, also did not perceive IWBs to be too technological complex as she had become accustomed to using an IWB early in her teaching career (Section 5.3). Interestingly, the other primary school teacher participant, Jane, perceived IWBs to be far more technologically complex despite the fact that she had been introduced to IWBs at the same time as Diane, and both had received similar initial professional learning. In addition to perceiving fewer benefits associated with using an IWB (Chapter 4, Table 4.3-3) and identifying numerous drawbacks associated with their use (see Section 4.3), Jane also used the IWB in a far more limited and less interactive manner than did Diane (Table 4.3-1). Research recommended collegial modelling and professional learning focused specifically on enhancing understanding of how to use an IWB should be helpful to combat perceptions of technological complexity (Thompson et al., 1991), but it is difficult to say whether or how this might have been differently available to Diane and Jane.

6.6.6 Variable 6 - Facilitating Conditions for Using IWBs

The facilitating conditions for university staff and pre-service teachers for using IWBs were not as supportive as they could be for promoting their most effective use. University staff members' responses to Likert statements probing the facilitating conditions surrounding their use of IWBs revealed that conditions could be improved for the majority of participants (Table 4.6.5-2, Section 4). Analysis of these data also revealed the highest standard deviations recorded out of all the variables examined in this project. This variation was particularly evident in the statements relating to adequacy of time for learning to use an IWB, opportunities for observing other staff members using an IWB, access to IWBs, and support for and encouragement of IWB use (Table 4.5.6-2). Indeed, one of the university staff member interviewees considered the varying levels of IWB access for staff members to be inequitable (see Section 5.5.6). The statistically significant difference between the two means

indicated that pre-service teachers perceived slightly more supportive facilitating conditions than did the university staff members regarding all but two of the statements, these being access to IWBs and opportunities for observing university staff members using IWBs. Statistically significant differences were found for four of the eight statements probing participants' responses to this variable (Section 4.5.6). Interestingly, one primary school teacher, Diane, believed the facilitating conditions at her school were much better than did the other survey participant, Jane, despite the fact they were employed at the same school, taught under the same principal, and had the same level of access to the technology (Table 4.5.6-3). This suggests that for the acceptance and use of IWB technology, the provision of supportive facilitating conditions is still reliant on a teacher's perceptions.

6.6.7 Variable 7 - Pedagogy

Overall, pre-service teachers' responses to the eight statements investigating the seventh variable indicated that they perceived their Pedagogy to better suit using an IWB than did the responses of university staff (Table 4.5.7-1). Statistically significant differences were found regarding seven of the eight statements (Section 4.5.7). Research (Campbell & Kent, 2010; Jones & Vincent, 2010) has drawn attention to the impact that a teacher's pedagogy can have on how effectively an IWB is used, as well as on a teacher's progression through the stages of IWB use, as described by Goodwin (2011) (Chapter 2). There was a difference in the opinions of pre-service teachers and university staff survey participants regarding whether or not IWBs help students learn; more than 90 (77%) pre-service teachers thought that IWBs helped students learn compared with only two (13%) university staff members (Section 4.5.7). This is important, because a teacher's pedagogy is influenced by many things, including his/her experiences, personality traits, school culture, knowledge, beliefs and understandings about how students learn (Kennewell, 2005).

On average, university staff thought that their teaching style would need to change for them to use an IWB effectively; pre-service teachers were more inclined, on average, to think that their teaching style was suited to using an IWB, however, their response mean scores also showed that they thought their teaching style could still be improved (see Section 4.5.7). One of the primary school teachers very strongly felt that IWBs did help students learn, whereas the other teacher was unsure (Section 4.5.7).

Developing an interactive pedagogical approach is vital for teachers to capitalise on the potential of IWBs, and is particularly vital for teachers who do not understand the benefits of using the technology (Campbell & Kent, 2010; Jones & Vincent, 2010). Research has shown that education in the use of IWBs can be the catalyst for pedagogical change as this understanding can provide the impetus for teachers to invest the time and effort needed to adapt (Glover & Miller, 2001; 2002b). However, as noted in Section 6.3, IWBs should be introduced early into teacher education courses because pre-service teachers develop the foundations of their pedagogy during their time at university (Betcher & Lee, 2009; Campbell & Kent, 2010; Campbell & Martin, 2010). Further to this, as primary school teacher Diane noted, there is so much for new teachers to learn when they gain a teaching position, that having the skills to use an IWB effectively beforehand would be advantageous for all stakeholders (see Section 5.3).

6.7 Summary of the Key Differences and Connections Between Perceptions of the Three Participant Groups in this Study

The key differences in the perceptions of pre-service teachers, university teaching staff, and primary school teachers, as identified in Chapter 4, Section 4.6, as well as the five connecting themes identified in Chapter 5, Section 5.6, are reviewed and summarised in turn in this section.

6.7.1 Perceived Usefulness of IWBs

Overall, both the pre-service teacher and primary school teacher participants perceived IWBs to be a more useful teaching tool than did university staff members (Figure 4.6.5-1); in fact, of the 145 pre-service teacher participants, only one did not think they would be expected to use one when they gained a teaching position, and nine were uncertain (Chapter 4, Section 4.2). In contrast, only four (22%) of the university teaching staff participants believed there was an expectation for them to use an IWB in their teaching (Figure 4.4-2). However, as noted in Section 6.6.1, the wide standard deviation of university staff responses may have been due to the participants' differing perceptions of subjective norm (Ajzen, 1991), as described in Section 2.9.7. This is likely due to the inconsistency in facilitating conditions reported by university staff; some university staff had consistent IWB access, some had occasional access, and others had little to no IWB access at all (Chapter 4, Section 4.4). Similarly, the

availability of professional learning opportunities varied between university staff. The lack of set expectations for IWB use in educational facilities, combined with a lack of available education in IWB use, meant that it was remarkable that as many participants found IWBs to be useful as they did. In comparison, the primary school teachers taught in an educational facility that had a culture whereby IWB use was expected and actively encouraged (Section 4.3). Although their access to external sources of IWB professional learning was limited, the teachers were encouraged to share their ideas and learning with colleagues frequently, thus enhancing the importance of developing their IWB skills and raising the importance of using IWBs for teachers. This approach aligns with research findings that indicate professional development in the form of mentoring by colleagues who are not necessarily experts can lead to enhanced pedagogy (Stoll, Harris & Handscomb, 2012). Similarly, perceptions of the usefulness of technology can become more positive through experiences that highlight the benefits for student learning (Sparrgrove, 2009), as well as opportunities to observe and explore the flexibility and versatility of the technology and how it can engage students and support an interactive teaching approach (Smith et al, 2005).

In consideration of the fact that only 37 (25%) of the 145 pre-service teachers saw an IWB being utilised in any form at university, compared with 90 (62%) who saw an IWB being used when on professional experience (Section 4.2), it is little wonder that pre-service teachers have differing perceptions of how useful an IWB can be. Indeed, 72 (50%) pre-service teachers saw students interacting with an IWB, thus reinforcing the view of technology supporting and motivating student learning, and broadening ideas about how IWBs could be used across the curriculum (Section 4.2). The exposure and experience for pre-service teachers is non-systematic but the issue is arguably too important to be left to chance.

6.7.2 Attitude towards and Self-Efficacy with IWBs

As discussed above in Section 6.6.2, pre-service teacher and primary school teacher participants were more positive and less diverse in their responses than were university staff members regarding their attitude towards IWBs. Kutluca (2010) identified self-efficacy and technological knowledge as two of the variables that are likely to impact on a person's attitude to technology. In this instance, pre-service

teachers' responses demonstrated higher levels of self-efficacy than those of university teaching staff members (see Section 6.6.3). With regard to technological knowledge, both primary school teachers reported having education in IWB use during their teaching career, compared with approximately 10% of pre-service teachers and 25% of university staff members (see Sections 4.3, 4.2 & 4.4 respectively). This left the majority of respondents with a deficit of IWB skills, which would most likely have exerted a negative impact upon these participants' attitude towards IWB use (Kutluca, 2010). This supposition is substantiated by pre-service teacher interviewees who raised concerns about using an IWB in their future teaching career given their lack of skills (see Section 5.5).

Managerial support at various levels within an educational context, including verbal encouragement, is important for supporting teachers to accept new technologies (Campbell & Kent, 2010; Cheng et al., 2012; Groves & Zemel, 2000), and has been found to have a positive impact on a teacher's self-efficacy with technology (Compeau & Higgins, 1995). For the primary school teachers, managerial support was evident through the provision of IWBs for each class, as well as initial professional learning and ongoing encouragement (particularly the sharing of learning with colleagues) from the school principal, and still they differed in their use and attitude to the boards (Chapter 4, Section 4.3). Collegial mentoring of IWB use, particularly when provided on a 'just in time' basis, was been found to be an effective strategy for whole school professional development in a study investigating IWB implementation in Australian schools (Jones & Vincent, 2010). Neither the university staff members nor the pre-service teachers had experienced anywhere near the same level of managerial support as was received by the primary school teachers; the level of access to IWBs was limited or non-existent for most, as was education in IWB use and ongoing support (Chapter 4, Sections 4.4 & 4.2, respectively).

6.7.3 Perceived Ease of Use

Overall, the pre-service and primary school teacher participants perceived IWBs to be easier to use than did the university staff member participants (Section 4.5.4). Impacting on this perception was the uncertainty held by some university participants about whether IWBs were worth the effort needed to use them or not, as well as their higher perception that IWBs were technologically complex compared to that of pre-service teachers (Figure 4.6.5-5). Compounding the issue was the university staff

members' perception that IWBs were difficult to trouble-shoot (Figure 4.6.5-5). Research indicated that if the user's perceptions about the usefulness of technology are strong enough, low levels of perceived ease of use can be overcome (Davis et al., 1989). In this instance, university staff members' responses were less than positive (Table 4.5.1-1). This means that IWBs were extremely unlikely to be used without intervention methods, such as carefully orchestrated professional learning sessions, being put into place (Smith, 2000), or without some evidence or clear directive from management valuing the development of IWB skills.

6.7.4 Facilitating Conditions

Overall, the facilitating conditions were less than conducive for both pre-service teacher and university staff member participants for using an IWB effectively as a teaching tool. Poor facilitating conditions have the potential to exert a negative influence on the application of technology (Ngai et al., 2007; Robey, 1979; Teo, 2009; Thompson et al., 1991). Of particular concern was the lack of access to IWBs, lack of technical support, lack of encouragement, and lack of education in IWBs use with regard to both pedagogical understanding and practical IWB skills experienced by many participants (Figure 4.6.5-6). Research has shown that users of IWBs are more likely to become competent users if they have regular, unrestricted access (Armstrong et al., 2005; Cuthell, 2003). Hence the restricted access to IWBs experienced by the majority of participants in this study would have been detrimental to the development of their IWB skills (Campbell & Kent, 2010; Grainger & Tolhurst, 2005; Slaouti & Barton, 2007). A lack of support, particularly the lack of provision of education in the use of IWBs, was another highly influential factor that resulted in multiple repercussions. As a result, the development of the IWB skills of the 16 (89%) university staff members (Section 4.4) and 132 (91%) pre-service teachers (Section 4.2) who did not receive education in IWB use was likely to have been hindered (Betcher & Lee, 2009). Subsequently, it would be less likely that the university staff members would be in a position to model the effective use of an IWB to pre-service teachers. Instead, it could be expected that they tend to utilise alternative teaching methods (Russo & Dosher, 1983, as cited in Sparrgrove, 2009), experience difficulty trouble-shooting basic issues should they arise if they did choose to use an IWB, and be less likely to be able to help colleagues learn to use one, thus also losing an important source of professional learning (Beauchamp, 2004). For the

pre-service teacher participants, the lack of modelling of effective IWBs use by university staff is a loss of a valuable resource (Kennewell, 2005). Furthermore, as research has shown, early introduction to IWB use at university has the potential to influence the development of pre-service teachers' pedagogy (Campbell & Martin, 2010).

Seeing university teaching staff trouble-shoot IWB issues could also be a valuable source of learning that could have assisted pre-service teachers during their professional experience. Numerous pre-service teachers reported observing basic trouble-shooting issues that neither they, nor their colleague teacher, had the skills to fix (see Section 5.5.6). Regarding the two primary school teacher participants, both teachers indicated that they would benefit from further professional learning in IWB use, regardless of the fact one teacher's skills were far more developed than the other (see Section 4.3). There is little doubt that the facilitating conditions for using an IWB had impacted on the use of IWBs of all the participants in this study.

6.7.5 Pedagogy

On average, the pre-service teacher and primary school teacher participants in this study thought that their pedagogy was better suited to using an IWB than did the university staff member participants. In fact, overall, university staff thought their pedagogy would need to change, whereas pre-service teachers were less certain (Figure 4.6.5-7), most likely due to their lack of experience and education in their use. Regardless, ongoing professional learning is often needed for teachers to fully capitalise on the potential of IWBs as a teaching tool; technical competency cannot compensate for poor pedagogy (Campbell & Kent, 2010; Jones & Vincent, 2010). Research showed that the provision of IWB technology does not guarantee that a teacher will use it, but that the quality and level of integration depends upon a teacher's preferences and pedagogical approach (Armstrong et al., 2005). The need to develop both the technical competency with IWBs and the ideal pedagogical approach is reflected in Goodwin's (2011) stages of IWB use continuum (Section 2.6). Without this development, research has found that a teacher's IWB skills tend to be restricted, resulting in less interactive lessons that have taken more time than they should to create (Greiffenhagen, 2000; McCormick & Scrimshaw, 2001). This links back to the importance of introducing IWBs to pre-service teachers early in their teacher education course, as discussed in Section 6.3, so that pre-service teachers have the

opportunity to develop both their practical hardware/software skills, as well as their pedagogical approach.

6.8 Conclusions

The purpose of this research project was to investigate the nature and extent of education in IWB use gained by pre-service teachers enrolled in the Bachelor of Education course at UTAS. It sought to examine links between pre-service teachers' practical IWB skills, their self-efficacy with this technology, and their understanding of relevant pedagogy. Another aspect of this research project was focused on exploring the extent to which UTAS Faculty of Education teaching staff utilised IWBs in their teaching program, including the identification of influential factors and uncovering significant relationships between identified factors. Furthermore, it aimed to compare the nature and extent of pre-service teachers' education in IWB use with teaching practices at a local primary school.

It is evident, that any form of education in IWB was not a feature of these pre-service teachers' teacher education course. However, IWBs are embedded in classes around Australia, with numbers increasing every year (Chapter 2, Section 2.3), and therefore are becoming a regular classroom tool for which teachers need the skills and pedagogical understanding to use effectively. Overall, this study found that approximately half the pre-service teachers involved in this study perceived themselves to be prepared to use an IWB whilst the other half did not (see Section 4.2). Regardless of the campus attended, approximately 75% (108) pre-service teachers did not see an IWB used at all whilst at university (Figure 4.2-2). The three most common reasons for this were no IWBs on campus, no opportunity, and studying via distance (see Section 4.2), the first two of which are indicative of poor facilitating conditions, the sixth variable investigated in this study (Section 6.7.4). Only 12 (8%) pre-service teachers received education in IWB use during their teacher education course at university, and that which was received was extremely minimal (see Section 4.2), with the types of use experienced aligning with Goodwin's (2011) first stage of IWB use, substitution (see Section 2.6.1). Clearly, improved facilitating conditions would be conducive to improved education in IWB use for these pre-service teachers.

The majority of education in IWB use gained by pre-service teachers was through

their professional experience and was often incidental in nature; only 17 (12%) pre-service teachers received specific education in the use of IWBs (Section 4.2). Overall, 75% (108) of pre-service teachers reported observing an IWB being used in some capacity whilst on professional experience, whilst 57% (83) were given the opportunity to use one (see Section 4.2). Thirteen (9%) pre-service teachers underwent professional experience in classrooms that were not equipped with an IWB, and hence, were unable to gain any experience or education in their use during this time (see Section 4.2). Thus, it can be concluded that professional experience was a valuable resource for these pre-service teachers to learn to use an IWB. However, the type and depth of education in IWB use that pre-service teachers experienced was dependent upon the availability of the technology and the attitude, pedagogy and skills of the colleague teacher (see Campbell & Kent, 2010, Section 2.9, related survey data, Section 4.2 & related interview data, Section 5.2.7). Considering the vastly different IWB skills, teaching approach and attitude toward IWBs of primary school teachers Diane and Jane (see Section 4.3), it is understandable that pre-service teachers doing professional experience in Diane's classroom would be far more likely to receive extensive experience and education in IWB use than they would in Jane's classroom. Professional experience should be viewed as a valuable supplement for teaching pre-service teachers how to use IWBs, rather than inadvertently being the main source of education in IWB use for many, as is currently the case. Ideally, in the future, perhaps the partnership between universities and schools could be strengthened to ensure that pre-service teachers are able to capitalise on the expertise of practicing teachers who are competent with using IWBs during their professional experiences.

Although the range of IWB functions observed by pre-service teachers (Table 4.2-2), and the types of IWB skills they learned (Table 4.2-3), were quite similar, IWBs were used in a broader range of curriculum areas in primary school classrooms than they were at university (Table 4.2-1). This aligns with the practice of both primary school teachers, Diane and Jane, who indicated that they used IWBs across the curriculum, although Diane's use was far more advanced and interactive than was Jane's (see Section 4.3). In consideration of the fact that each pre-service teacher undergoes approximately 32 units in the duration of his/her teacher education course (see Section 6.3), there is immense potential to integrate IWB education into many more

curriculum areas in initial teacher education at university. Indeed, pre-service teachers perceived there to be an expectation for them to use an IWB in their teaching when they became fully qualified teachers (see Section 4.2), and the vast majority of pre-service teachers indicated that they would like to see IWBs embedded throughout their teacher education course to develop both their skills and pedagogical understanding (Section 6.3).

A straight-forward solution to improving pre-service teachers' IWB skills and pedagogical understanding might appear to be for universities simply to embed IWBs into teacher education courses; however, the findings of this study show that in reality, it is not that easy. Fewer than half of the university staff participants (44%, Section 4.4) thought they would be capable of using an IWB effectively in their teaching, meaning that more than half (56%) of staff were not in a position to teach with, or about, IWBs. Combined with the lack of IWB access indicated by university staff (see Section 4.4), this means that the provision of more IWB hardware, as well as education in IWB use, across the university campuses would be needed. With only four (22%) university staff perceiving there to be an expectation for them to use an IWB in their teaching (Figure 4.4-2), such provisions would potentially serve to enhance their expectation levels. This was the case for the primary school teachers, Diane and Jane, who both had IWBs in their classroom and believed they were expected to use them (see Section 4.3). The vast majority of pre-service teachers (131, 91%) observed IWBs in classrooms in which they did their professional experience (see Section 4.2); hence, it is understandable that they perceived there to be higher expectations for them to use IWBs once qualified, compared with the perceptions of university staff.

All seven potentially influential variables (Table 5.5-1) investigated were found to have influenced the pre-service teacher and university staff participants in this study. With only one (6%) university staff member compared to 118 pre-service teachers (97%) agreeing that an IWB is a useful teaching tool (Table 4.5.1-2), it is little wonder that pre-service teachers overwhelmingly perceived IWBs to be more useful than did university staff (Variable 1). Pre-service teachers also had a more positive attitude towards IWB use than did university staff (Variable 2), particularly regarding the importance of IWBs as a teaching tool (Table 4.5.2-1). Despite the lack of education in IWB use received by pre-service teachers, it is interesting that they still

perceived greater self-efficacy with using IWBs (Variable 3, Section 4.5.3), as well as greater ease of use of IWBs (Variable 4, Section 4.5.4), than did university staff. Regarding Variable 5, it is evident from Table 4.5.5-1 (Section 4.5.5), that university staff perceived IWBs to be more technologically complex than did pre-service teachers. The facilitating conditions (Variable 6) were not conducive for the majority of participants for using an IWB, particularly due to poor IWB access, and minimal support, encouragement and education in IWB use (see Section 4.5.6). Pre-service teachers perceived their pedagogical approach to be better suited to IWB use than did university staff (Variable, 7, see Section 4.5.7).

Simply installing IWBs in a classroom, whether in a primary classroom setting or in a university, is not enough (Campbell & Martin, 2010). For users to progress through Goodwin's (2011) stages of IWB use, they need both the technical know-how, and the appropriate pedagogical understanding. This is best facilitated through consistent access, ongoing professional learning in IWB use, from both external and internal experts, time to explore IWBs, and the opportunity to see how colleagues use their IWBs. With encouragement and support from colleagues and management, including the provision of technical support, confidence levels, perceptions of the usefulness of IWBs, and attitudes towards IWBs can be enhanced. However, this study's findings suggest that it may not be the actual availability of support so much as the teachers' perception of the availability of support that matters. The heart of the challenge is not to use technology for the sake of technology, but to maintain an educational focus by positioning teachers to be able to harness the interactive potential of IWB technology and embed it into daily practice in innovative and engaging ways, for the purpose of enhancing student learning.

Although this study has focused on IWB technology, this study's findings are relevant to the implementation of future technologies. Student learning must remain the focus, with technology used in meaningful and innovative ways to engage and support this; to do so, teachers must keep up with the technology, both pedagogically and with regard to technical skills.

6.9 Limitations

The most notable limitation of this study stems from the low number of primary school teacher participants. It was hoped to gather data from numerous Tasmanian primary schools, however only one principal consented for teaching staff to

participate in the study if they so chose. Even then, only two of these teachers chose to participate in the survey, and only one consented to an interview. The inexperience of participants with IWBs was also a potential limitation of this study because it was likely to have contributed to the number of 'unsure' responses received to some of the Likert statements. Also, whilst 145 pre-service teachers and 18 university staff chose to respond to the survey, there may have been more potential participants who had received education in IWB use, but chose not to participate. The limitation due to low participation may impact upon the generalisability of the study results to the wider population.

The interview sub-group was comprised of all the survey participants who indicated their willingness to be interviewed, these being 19 pre-service teachers, two university staff members, and one primary school teacher. Initially, it was planned to select a wide cross range of participants from each group in order to gain a broad range of respondents. However, due to the low number of primary school teacher participants overall, as well as the low number of university staff member interview participants, it was very difficult to ensure that the interviewed sub-group were a genuinely accurate representation of the population, and therefore is deemed a limitation of this study as the small size sample reduced the extent the findings can be generalised (Burns, 2000).

6.10 Suggestions for Future Research

Further research could be conducted into exploring creative ways IWBs could be integrated into teacher education courses on campus, as well as for distance students. Another research opportunity lies in further investigation of the powerful influence of perceptions related to technology use. More extensive investigation into teacher use of IWBs in primary schools is also recommended.

6.11 Final Thoughts

Interactive Whiteboards are now entrenched in school classrooms and the technology is evolving into various forms of eBoards and interactive flat panel displays. They have considerable pedagogical potential, but if this potential is to be realised, there is considerable work needed both during initial teacher education within the university setting and on practicum. Access to the technology, appropriate and on-going professional learning, and open access to IWBs for students to practice their use, are some ways in which this issue may be addressed.

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APPENDICES

Appendix A

Human Research Ethics Committee Approval Letter

Social Science Ethics Officer
Private Bag 01 Hobart
Tasmania 7001 Australia
Tel: (03) 6226 2763
Fax: (03) 6226 7148
Katherine.Shaw@utas.edu.au

HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

23 June 2011

Assoc Prof Kim Beswick
Faculty of Education
University of Tasmania
Locked Bag 1307
Launceston Tasmania 7250

Student Researcher: Marissa Saville (Honours)

Dear Assoc Prof Beswick

Re: MINIMAL RISK ETHICS APPLICATION APPROVAL
Ethics Ref: H0011870 - Teaching with interactive whiteboards: is teacher education up to IT?

We are pleased to advise that acting on a mandate from the Tasmania Social Sciences HREC, the Chair of the committee considered and approved the above project on 22 June 2011.

Please note that this approval is for four years and is conditional upon receipt of an annual Progress Report. Ethics approval for this project will lapse if a Progress Report is not submitted.

The following conditions apply to this approval. Failure to abide by these conditions may result in suspension or discontinuation of approval.

1. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval, to ensure the project is conducted as approved by the Ethics Committee, and to notify the Committee if any investigators are added to, or cease involvement with, the project.

2. Complaints: If any complaints are received or ethical issues arise during the course of the project, investigators should advise the Executive Officer of the Ethics Committee on 03 6226 7479 or human.ethics@utas.edu.au.

A PARTNERSHIP PROGRAM IN CONJUNCTION WITH THE DEPARTMENT OF HEALTH AND HUMAN SERVICES

3. Incidents or adverse effects: Investigators should notify the Ethics Committee immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.

4. Amendments to Project: Modifications to the project must not proceed until approval is obtained from the Ethics Committee. Please submit an Amendment Form (available on our website) to notify the Ethics Committee of the proposed modifications.

5. Annual Report: Continued approval for this project is dependent on the submission of a Progress Report by the anniversary date of your approval. You will be sent a courtesy reminder closer to this date. **Failure to submit a Progress Report will mean that ethics approval for this project will lapse.**

6. Final Report: A Final Report and a copy of any published material arising from the project, either in full or abstract, must be provided at the end of the project.

Yours sincerely

Katherine Shaw
Acting Executive Officer

Appendix B

Department of Education Approval Letter

Department of Education
EDUCATIONAL PERFORMANCE SERVICES

73 Murray Street, Hobart
GPO Box 169, Hobart, TAS 7001 Australia

Tasmania

File: 1359837

20 December 2011

Marissa Saville
32 Warragul Street
Norwood
Tas, 7250

Dear Ms Saville

Teaching with Interactive Whiteboards

I have been advised by the Educational Performance Report Committee that the above research study adheres to the guidelines and that there is no objection to the study proceeding.

Please note that you have been given permission to proceed at a general level, and not at individual school level. You must still seek approval from the principal of the selected schools before you can proceed with your study.

A copy of your final report must be forwarded to Educational Performance Services, Department of Education, GPO Box 169, Hobart, 7001 at your earliest convenience and within six months of the completion of the research phase.

Yours sincerely

[redacted]

Tony Luttrell
Manager
(Educational Performance Services)

Appendix C

Information Sheets

UTAS FACULTY OF EDUCATION TEACHING STAFF PARTICIPANT INFORMATION SHEET

Teaching with Interactive Whiteboards: Is Teacher Education up to IT?

Invitation

You are invited to participate in a research study into how well prepared pre-service teachers are for using interactive whiteboards (IWBs) in Tasmanian primary classrooms. The study is being conducted by Associate Professors Kim Beswick and Rosemary Callingham (research supervisors), from the Faculty of Education at the University of Tasmania, and Marissa Saville (doctoral student).

1. 'What is the purpose of this study?'

The purpose of this study is to investigate the extent of practical experience pre-service teachers at the University of Tasmania have with using Interactive Whiteboards (IWBs), relevant software programs and peripheral technologies. IWBs are widely recognised as a valuable teaching tool and are becoming a common sight in Tasmanian schools. However a lack of practical skills and methodological training can greatly reduce the effectiveness with which these are used. Focus will also be placed on links between pre-service teachers' IWB skills, their self-efficacy with this technology, and understanding of teaching pedagogy. A comparison will also be drawn between teacher preparation for teaching with IWBs and current school practices.

2. 'Why have I been invited to participate in this study?'

You are eligible to participate in this study because you are a member of the teaching staff at the University of Tasmania in the Faculty of Education.

3. 'What does this study involve?'

If you choose to take part in this study, you will be invited to respond to a series of online statements that relate to your understanding and perceptions of IWBs using a 5 point scale ranging from 'Strongly Agree' to 'Strongly Disagree'. You will also be asked to provide demographic information, such as your gender, approximate age, and information about your experiences (or lack thereof) with IWBs. You will also have the opportunity to include any other information you consider relevant to the study, such as relevant professional learning, available resources, and ongoing support for utilising them in their teaching. If you are willing to participate in this study, the completion of the survey will be accepted as your formal consent that you have understood all of the information concerning that part of the study and are willing to participate in it by contributing data.

At the end of the survey, you will be asked to indicate your willingness to participate in an interview related to the issues raised in the survey. The interview will take approximately 15-20 minutes and focus on key points identified by analysis of the survey. The interview will be audio-recorded and pseudonyms will be used in the transcripts and any study references. The staff to be interviewed will be selected from those who indicate their willingness at the end of the survey. If you are selected for interview a formal 'Statement of Informed Consent' will be emailed and discussed with you. This form must then be signed, confirming you have read and understood all

of the information concerning the project and is required as evidence of your consent to participate in the interview.

The survey will take approximately 10-15 minutes to complete. It is important that you understand that your involvement is this study is voluntary. While we would be pleased to have you participate, we respect your right to decline. There will be no consequences to you if you decide not to participate. If you decide to discontinue participation at any time, you may do so without providing an explanation. All information will be treated in a confidential manner, and your name will not be used in any publication arising out of the research. The data will be kept secure in locked filing cabinets in the office of Assoc. Prof. Kim Beswick at the School of Education, UTas, and in password protected computer files. After 5 years, the data will be deleted and audio recordings wiped as per UTAS guidelines.

4. Are there any possible benefits from participation in this study?

The results of this study will provide feedback and guidance for enhancing future learning programs at UTAS and raise awareness and understanding of this technology amongst pre-service teachers and UTAS staff. We will be interested to see if you experience any other benefits from this study. If we are able to take the findings of this small study and link them with a wider study, the result may be valuable information for others and it may lead to benefits to student learning in Tasmanian classrooms and beyond.

5. What if I have questions about this research?

If you would like to discuss any aspect of this study please feel free to contact either Marissa Saville or Kim Beswick on ph (03) 6324 3167. Either of us would be happy to discuss any aspect of the research with you. Once we have analysed the information we will be mailing/emailing you a summary of our findings. You are welcome to contact us at that time to discuss any issue relating to the research study.

This study has been approved by the Tasmanian Social Science Human Research Ethics Committee. If you have concerns or complaints about the conduct of this study should contact the Executive Officer of the HREC (Tasmania) Network on (03) 6226 7479 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. You will need to quote H11870.

Thank you for taking the time to consider this study.

This information sheet is for you to keep.

PRE-SERVICE TEACHER
PARTICIPANT INFORMATION SHEET

Teaching with Interactive Whiteboards: Is Teacher Education up to IT?

Invitation

You are invited to participate in a research study into how well prepared pre-service teachers are for using interactive whiteboards (IWBs) in Tasmanian primary classrooms. The study is being conducted by Associate Professors Kim Beswick and Rosemary Callingham (research supervisors), from the Faculty of Education at the University of Tasmania, and Marissa Saville (doctoral student).

2. 'What is the purpose of this study?'

The purpose of this study is to investigate the extent of practical experience pre-service teachers at the University of Tasmania have with using Interactive Whiteboards (IWBs), relevant software programs and peripheral technologies. IWBs are widely recognised as a valuable teaching tool and are becoming a common sight in Tasmanian schools. However a lack of practical skills and methodological training can greatly reduce the effectiveness with which these are used. Focus will also be on identifying links between pre-service teachers' IWB skills, their self-efficacy with this technology, and understanding of teaching pedagogy. A comparison will also be drawn between teacher preparation for teaching with IWBs and current school practices.

2. 'Why have I been invited to participate in this study?'

You are eligible to participate in this study because you are currently enrolled in the Bachelor of Education program at the University of Tasmania.

3. 'What does this study involve?'

If you choose to take part in this study, you will be invited to respond to a series of online statements that relate to your understanding and perceptions of IWBs using a 5 point scale ranging from 'Strongly Agree' to 'Strongly Disagree'. You will be asked to provide demographic information, such as your gender, approximate age, year of teacher training (e.g. first year, second year, etc), and information about your experiences (or lack thereof) with IWBs. You will also have the opportunity to include any other information you consider relevant to the study. The survey will take approximately 10-15 minutes to complete. If you are willing to participate in this study, the completion of the survey will be accepted as your formal consent that you have understood all of the information concerning that part of the study and are willing to participate in it by contributing data.

At the end of the survey, you will be asked to indicate your willingness to participate in an interview related to the issues raised in the survey. The interview will take approximately 15-20 minutes and focus on key points identified by analysis of the survey. The interview will be audio-recorded and pseudonyms will be used in the transcripts and any study references. The pre-service teachers to be interviewed will be selected from those who indicate their willingness at the end of the survey.

If you are selected for interview a formal 'Statement of Informed Consent' will be emailed and discussed with you. This form must then be signed, confirming you have

read and understood all of the information concerning the project and is required as evidence of your consent to participate in the interview.

It is important that you understand that your involvement is this study is voluntary. Although we would be pleased to have you participate, we respect your right to decline. There will be no consequences to you if you decide not to participate. If you decide to discontinue participation at any time, you may do so without providing an explanation. All information will be treated in a confidential manner, and your name will not be used in any publication arising out of the research. The data will be kept secure in locked filing cabinets in the office of Assoc. Prof. Kim Beswick at the School of Education, UTAS, and in password protected computer files. After 5 years, the data will be deleted and audio recordings wiped as per UTAS guidelines.

4. Are there any possible benefits from participation in this study?

The results of this study will provide feedback and guidance for enhancing future learning programs at UTAS and raise awareness and understanding of this technology amongst pre-service teachers and UTAS staff. We will be interested to see if you experience any other benefits from this study. If we are able to take the findings of this small study and link them with a wider study, the result may be valuable information for others and it may lead to benefits to student learning in Tasmanian classrooms and beyond.

5. What if I have questions about this research?

If you would like to discuss any aspect of this study please feel free to contact either Marissa Saville or Kim Beswick on ph (03) 6324 3167. Either of us would be happy to discuss any aspect of the research with you. Once we have analysed the information we will be mailing/emailing you a summary of our findings. You are welcome to contact us at that time to discuss any issue relating to the research study.

This study has been approved by the Tasmanian Social Science Human Research Ethics Committee. If you have concerns or complaints about the conduct of this study should contact the Executive Officer of the HREC (Tasmania) Network on (03) 6226 7479 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. You will need to quote H11870.

Thank you for taking the time to consider this study.

This information sheet is for you to keep.

PRIMARY SCHOOL TEACHER PARTICIPANT INFORMATION SHEET

Teaching with Interactive Whiteboards: Is Teacher Education up to IT?

Invitation

You are invited to participate in a research study into how well prepared pre-service teachers are for using interactive whiteboards (IWBs) in Tasmanian primary classrooms. The study is being conducted by Associate Professors Kim Beswick and Rosemary Callingham (research supervisors), from the Faculty of Education at the University of Tasmania, and Marissa Saville (doctoral student).

'What is the purpose of this study?'

The purpose of this study is to investigate the extent of practical experience pre-service teachers at the University of Tasmania have with using Interactive Whiteboards (IWBs), relevant software programs and peripheral technologies. IWBs are widely recognised as a valuable teaching tool and are becoming a common sight in Tasmanian schools. However a lack of practical skills and methodological training can greatly reduce the effectiveness with which these are used. Focus will also be placed on links between pre-service teachers' IWB skills, their self-efficacy with technology, and understanding of teaching pedagogy. A comparison will also be drawn between teacher preparation for teaching with IWBs and current school practices.

2. 'Why have I been invited to participate in this study?'

You are eligible to participate in this study because you are a registered primary school teacher in Tasmania, who is teaching in one of the three schools selected for this study.

3. 'What does this study involve?'

If you choose to take part in this study, you will be invited to respond to a series of online statements that relate to your understanding and perceptions of IWBs using a 5 point scale ranging from 'Strongly Agree' to 'Strongly Disagree'. You will also be asked to indicate your gender, approximate age, and information about your experiences (or lack thereof) with IWBs. You will also have the opportunity to include any other information you consider relevant to the study, such as relevant professional learning, available resources, and ongoing support for utilising them in their teaching. If you are willing to participate in this study, the completion of the survey will be accepted as your formal consent that you have understood all of the information concerning that part of the study and are willing to participate in it by contributing data.

At the end of the survey, you will be asked to indicate your willingness to participate in an interview related to the issues raised in the survey. The interview will take approximately 15-20 minutes and focus on key points identified by analysis of the survey. The interview will be audio-recorded and pseudonyms will be used in the transcripts and any study references. The staff to be interviewed will be selected from those who indicate their willingness at the end of the survey. If you are selected for

interview a formal 'Statement of Informed Consent' will be emailed and discussed with you. This form must then be signed, confirming you have read and understood all of the information concerning the project and is required as evidence of your consent to participate in the interview.

The survey will take approximately 10-15 minutes to complete. It is important that you understand that your involvement is this study is voluntary. While we would be pleased to have you participate, we respect your right to decline. There will be no consequences to you if you decide not to participate. If you decide to discontinue participation at any time, you may do so without providing an explanation. All information will be treated in a confidential manner, and your name will not be used in any publication arising out of the research. The data will be kept secure in locked filing cabinets in the office of Assoc. Prof. Kim Beswick at the School of Education, UTas, and in password protected computer files. After 5 years, the data will be deleted and audio recordings wiped as per UTAS guidelines.

4. Are there any possible benefits from participation in this study?

The results of this study will provide feedback and guidance for enhancing future learning programs at UTAS and raise awareness and understanding of this technology amongst pre-service teachers and UTAS staff. We will be interested to see if you experience any other benefits from this study. If we are able to take the findings of this small study and link them with a wider study, the result may be valuable information for others and it may lead to benefits to student learning in Tasmanian classrooms and beyond.

5. What if I have questions about this research?

If you would like to discuss any aspect of this study please feel free to contact either Marissa Saville or Kim Beswick on ph (03) 6324 3167. Either of us would be happy to discuss any aspect of the research with you. Once we have analysed the information we will be mailing/emailing you a summary of our findings. You are welcome to contact us at that time to discuss any issue relating to the research study.

This study has been approved by the Tasmanian Social Science Human Research Ethics Committee. If you have concerns or complaints about the conduct of this study should contact the Executive Officer of the HREC (Tasmania) Network on (03) 6226 7479 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. You will need to quote H11870.

Thank you for taking the time to consider this study.

This information sheet is for you to keep.

Appendix D

Statement of Informed Consent

CONSENT FORM

Teaching with Interactive Whiteboards: Is Teacher Education up to IT?

1. I have read and understood the 'Information Sheet' for this project.
2. The nature and possible effects of the study have been explained to me.
3. I understand that this part of the study involves an interview, either face-to-face, or over the phone, as is mutually convenient, and is likely to take 15-20 mins. The interview will be focused on issues raised in the initial questionnaire.
4. I understand that there are no specific risks anticipated from participation in this study, however I am also aware that assistance is available if distress occurs.
5. I understand that all research data will be securely stored on the University of Tasmania premises for five years, and will then be destroyed in accordance with UTAS guidelines.
6. Any questions that I have asked have been answered to my satisfaction.
7. I agree that research data gathered from me for the study may be published provided that I cannot be identified as a participant.
8. I understand that the researchers will maintain my identity confidential and that any information I supply to the researchers will be used only for the purposes of the research.
9. I agree to participate in this investigation and understand that I may withdraw at any time without any effect, and if I so wish, may request that any data I have supplied to date be withdrawn from the research.

Name of Participant: _____

Signature: _____ Date: _____

Statement by Investigator

☐ I have explained the project and the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation

If the Investigator has not had an opportunity to talk to participants prior to them participating, the following must be ticked.

☐ The participant has received the Information Sheet where my details have been provided so participants have the opportunity to contact me prior to consenting to participate in this project.

Name of investigator _____

Signature of investigator _____ Date _____

Appendix E

UTAS Faculty of Education
Teaching Staff Survey

UTAS Teaching Staff Survey

Q94 The first part of this survey gathers statistical information

Q1 Please approximate how much time you spend teaching at each UTAS Campus: (please make sure the total is less than or equal to 100%)
_____ The Sandy Bay Campus (Hobart) (1)

_____ The Newnham Campus (Launceston) (2)

_____ The Cradle Campus (Burnie) (3)

_____ Other (4)

Q2 Category of Employment:
- Casual/Sessional (1)
- Secondment (2)
- Contract (3)
- Continuing (permanent) (4)

Q3 Please indicate your gender:
- Male (1)
- Female (2)

Q4 Please indicate your age group:
- 18-25 (1)
- 26-30 (2)
- 31-40 (3)
- 41-50 (4)
- 51-60 (5)
- 61+ (6)

Q5 Please indicate if you have experience with any of the following types of technologies (tick all that apply):

- ❑ Interactive Whiteboard/eBoard (1)
- ❑ Data Projector (2)
- ❑ Calculator (3)
- ❑ CD/DVD (4)
- ❑ Video Recorder (5)
- ❑ Hard Disk Drive (DVD/CD) (6)
- ❑ Mobile Phone (7)
- ❑ IPad (and the like) (8)
- ❑ IPod/Mp3 (or the like) (9)
- ❑ Personal Computer (10)
- ❑ Laptop (11)
- ❑ Apple Mac Computer (12)
- ❑ Tablet (13)
- ❑ Netbook (14)
- ❑ Printer (15)
- ❑ Scanner (16)
- ❑ Webcam (17)
- ❑ Robotics (18)
- ❑ GPS (19)
- ❑ Other (20) _____

Q6 Please indicate if you have experience with any of the following types of software applications (tick all that apply):

- ❑ Internet Explorer (or similar web browser) (1)
- ❑ Word (or similar word processor) (2)
- ❑ Skype (or similar internet phone) (3)
- ❑ Email (4)
- ❑ Movie Maker (or similar movie editing software) (5)
- ❑ PowerPoint (or similar presentation software) (6)
- ❑ Excel (or similar spreadsheet software) (7)
- ❑ Access database (or similar database software) (8)
- ❑ Publisher (or similar design software) (9)
- ❑ Paint (or similar graphics software) (10)
- ❑ Photostory 3 (11)
- ❑ Photoshop (or similar photo editing software) (12)
- ❑ Other (13) _____
- ❑ None (14)

Q85 Are you confident using technology?

- ❍ Yes (1)
- ❍ No (2)
- ❍ Usually (3)
- ❍ Sometimes (4)

Q7 Approximately how many years have you been using a computer?
- ❍ 1-2 Year (1)
- ❍ 3-5 Years (2)
- ❍ 6-10 Years (3)
- ❍ 11-15 Years (4)
- ❍ 16-20 Years (5)
- ❍ 21-30 Years (6)
- ❍ 31+ Years (7)

Q8 What year did you first access a computer?
- ❍ Pre 1991 (1)
- ❍ 1991-2000 (2)
- ❍ 2001-2005 (3)
- ❍ 2006-2008 (4)
- ❍ 2009 (5)
- ❍ 2010 (6)
- ❍ 2011 (7)

Q9 When did you start using a computer on a regular basis, i.e. at least once a week?
- ❍ Pre 1991 (1)
- ❍ 1991-2000 (2)
- ❍ 2001-2005 (3)
- ❍ 2006-2008 (4)
- ❍ 2009 (5)
- ❍ 2010 (6)
- ❍ 2011 (7)

Q10 Do you use a computer, laptop, smart phone or other handheld device at home?

- ❍ Yes (1)
- ❍ No (2)

Answer If Do you use a computer, laptop, smart phone or other handh... Yes Is Selected

Q11 For what purpose/s do you use your computer at home (tick all that apply)?

- ❑ Check email (1)
- ❑ Internet resources (2)
- ❑ Social networking (3)
- ❑ Entertainment (4)
- ❑ Work preparation (5)

Answer If Do you use a computer, laptop, smart phone or other handh... Yes Is Selected

Q16 Approximately how many hours per week do you use your computer at home in total?

- ❍ 0-1 (1)
- ❍ 2-4 (2)
- ❍ 5-10 (3)
- ❍ 10-20 (4)
- ❍ 20-30 (5)
- ❍ 30+ (6)

Answer If Do you use a computer, laptop, smart phone or other handh... No Is Selected

Q17 Why not?

- ❍ Please explain (1) _____

Q18 Do you use a computer, laptop, smart phone or other handheld computing device at University?

- ❍ Yes (1)
- ❍ No (2)

Answer If Do you use a computer, laptop, smart phone or other handh... Yes Is Selected

Q20 For what purpose/s do you use a computer at UTAS (tick all that apply)?

- ❑ Check email (1)
- ❑ Internet resources (2)
- ❑ Social networking (3)
- ❑ Entertainment (4)
- ❑ Work preparation (5)
- ❑ Study preparation (6)

Answer If Do you use a computer, laptop, smart phone or other handh... Yes Is Selected

Q25 Approximately how many hours per week do you use a computer at UTAS in total?

- ❍ 0-1 (1)
- ❍ 2-4 (2)
- ❍ 5-10 (3)
- ❍ 10-20 (4)
- ❍ 20-30 (5)
- ❍ 30+ (6)

Answer If Do you use a computer, laptop, smart phone or other handh... No Is Selected

Q26 Why not?

- ❍ Please Explain (1) _____

Q87 How many years have you taught at University level?

- ❍ 0-2 (1)
- ❍ 3-5 (2)
- ❍ 6-10 (3)
- ❍ 11+ (4)

Q88 When did you commence teaching at UTAS (if more than once, please indicate the most recent applicable date range)?

- ❍ Pre 1991 (1)
- ❍ 1991-2000 (2)
- ❍ 2001-2005 (3)
- ❍ 2006-2008 (4)
- ❍ 2009 (5)
- ❍ 2010 (6)
- ❍ 2011 (7)

Q89 For how many years did/have you teach at a Primary School level?

- ❍ 0 (1)
- ❍ 1-2 (2)
- ❍ 3-5 (3)
- ❍ 6-10 (4)
- ❍ 11-20 (5)
- ❍ 21-30 (6)
- ❍ 31+ (7)

Q91 For how many years did/have you teach at a Secondary School level?

- ❍ 0 (1)
- ❍ 1-2 (2)
- ❍ 3-5 (3)
- ❍ 6-10 (4)
- ❍ 11-20 (5)
- ❍ 21-30 (6)
- ❍ 31+ (7)

Answer If For how many years have you taught at a Primary School le... 0 Is Not Selected And For how many years have you taught at a Secondary School ... 0 Is Not Selected

Q90 When did you commence your teaching career (if more than once, please indicate the most recent applicable date range)?

- ❍ Pre 1991 (1)
- ❍ 1991-2000 (2)
- ❍ 2001-2005 (3)
- ❍ 2006-2008 (4)
- ❍ 2009 (5)
- ❍ 2010 (6)
- ❍ 2011 (7)

Q77 Were IWBs used in any of the schools you attended as a Primary or Secondary School student?

- ❍ Yes (1)
- ❍ No (2)

Answer If Were IWBs used when you were a Primary or Secondary ... No Is Selected

Q78 Why not? (please select from the following)

- ❍ IWBs did not exist in educational facilities at this time (1)
- ❍ IWBs existed, however I did not see a teacher or student using one (2)
- ❍ IWBs existed, however I did not have the opportunity to use one (3)
- ❍ IWBs existed, however I chose not use one when I had the opportunity (please explain why) (4) _____

Answer If Were IWBs used in any of the schools you attended as ... Yes Is Selected

Q79 Please select one of the following

- ❍ IWBs existed and I saw a teacher using one (1)
- ❍ IWBs existed and I saw students using one (2)
- ❍ An IWB was available and I often used one (3)
- ❍ An IWBs was available and I used one occasionally (4)
- ❍ An IWB was available but I rarely used one (please explain why) (5) _____

Answer If Were IWBs used in any of the schools you attended as ... Yes Is Selected

Q80 In which subject area/s was an IWB used?

- ❍ Please list all relevant areas (1) _____

Answer If Were IWBs used in any of the schools you attended as ... Yes Is Selected

Q81 For what purpose was the IWB used? (select all relevant options)

- ❑ Screen for projection (1)
- ❑ Preloading teaching pages (2)
- ❑ Dragging or hiding items (3)
- ❑ Colour, shading and highlighting items (4)
- ❑ Downloading images or sounds (5)
- ❑ Annotating displayed items (6)
- ❑ Saving work (7)
- ❑ Digitally record interactive learning sequences (8)
- ❑ Displaying student work (9)
- ❑ Revisiting materials (10)
- ❑ Downloading from network (11)
- ❑ Subject specific software (12)
- ❑ Search engine (13)
- ❑ Movement or animation (14)
- ❑ Subject websites (15)
- ❑ National curriculum materials (16)
- ❑ Other (please explain) (17) _____

Q27 Did you use IWBs during your own teacher education course (i.e. when you were a pre-service teacher)?

- ❍ Yes (1)
- ❍ No (2)

Answer If Did you use IWBs during your own teacher education course... No Is Selected

Q28 Why not? (please select the applicable)

- ❍ IWBs did not exist in educational facilities at this time (1)
- ❍ There were IWBs but I did not have the opportunity to use one (2)
- ❍ I saw an IWB being used but did not use it myself (3)
- ❍ There were IWBs but I chose not to use one (please explain why you chose not to) (4) _____

Answer If Did you use IWBs during your own teacher education course... Yes Is Selected

Q29 How often were you able to use an IWB during your teacher education course?

- ❍ Rarely (1)
- ❍ Occasionally (2)
- ❍ Often (3)
- ❍ I saw an IWB being used but did not use it myself (4)

Answer If Did you use IWBs during your own teacher education course... Yes Is Selected

Q31 In which of your teacher education course subject areas was an IWB used?

- ❍ Please list all applicable courses (1) _____

Answer If Did you use IWBs during your own teacher education course... Yes Is Selected

Q32 How was the IWB used during your teacher education course? (please select all that are applicable)

- ❑ Screen for projection (1)
- ❑ Preloading teaching pages (2)
- ❑ Dragging or hiding items (3)
- ❑ Colour, shading and highlighting items (4)
- ❑ Downloading images or sounds (5)
- ❑ Annotating displayed items (6)
- ❑ Saving work (7)
- ❑ Digitally record interactive learning sequences (8)
- ❑ Displaying student work (9)
- ❑ Revisiting materials (10)
- ❑ Downloading from internet (11)
- ❑ Subject specific software (12)
- ❑ Search engine (13)
- ❑ Movement or animation (14)
- ❑ Subject websites (15)
- ❑ National curriculum materials (16)
- ❑ Other (17) _____

Q33 Did you have specific training in the use of an IWB during your own teacher education course?

- ❍ Yes (1)
- ❍ No (2)

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q34 Please indicate if you received training in any of the following basic features of IWBs during your own teacher education course (select all that apply):

- ❑ Learnt to connect computer to IWB & operating projector (1)
- ❑ Familiarisation with key IWB tools (2)
- ❑ Learnt to trouble-shoot common technical difficulties (3)

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q35 Please indicate if you received training in either of the following during your own teacher education course (select all that apply):

- ❑ Familiarisation with IWB dedicated software (provide details if possible) (1) _____
- ❑ Familiarisation with IWB subject specific resources (provide details if possible) (2) _____

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q36 Please indicate if you learnt how to do either of the following during your own teacher education course (select all that apply):

- ❑ Locate suitable internet resources for use on an IWB (1)
- ❑ Import images, sounds and video clips for use on an IWB (2)

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q37 Please indicate if you received training in any of the following pedagogies that support the use of an IWB during your own teacher education course (select all that apply):

- ❑ Learnt how to use an IWB to support mixed learning styles (1)
- ❑ Learnt how to reinforce learning with an IWB (2)
- ❑ Learnt how to enhance student motivation with an IWB (3)
- ❑ Learnt how to incorporate an interactive teaching style (4)

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q38 Please indicate if you have received training in how to plan lessons using an IWB during your own teacher education course (select all that apply):

- ❑ Learnt how an IWB can be used to re-cap previous lessons (1)
- ❑ Learnt how to create lesson sequences and diagrams (2)
- ❑ Learnt the value of a school based resource bank (3)
- ❑ Other (please explain) (4) _____

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q40 Please indicate which of the following sources you learned IWB skills from during your own teacher education course (tick all that apply):

- ❑ Learned from external experts coming to class/es (1)
- ❑ Learned from recognised experts within the University community (2)
- ❑ Learned by asking peers for help (3)
- ❑ Learned by watching peers (4)
- ❑ Learned by self-exploration (5)
- ❑ Learned by watching University staff use it in their teaching (6)
- ❑ Other (7) _____

Answer If Did you have specific training in the use of an IWB durin... No Is Selected

Q41 If you didn't receive any IWB training, please indicate why not:

- ❍ IWB training was not available (1)
- ❍ IWB training was available, however I did not have the opportunity to undertake it - please explain why (2) _____
- ❍ IWB training was available, however I chose not to do it - please explain why (3) _____

Q42 Did you use an IWB during your school teaching career (pre-University level teaching)?

- ❍ Yes (1)
- ❍ No (2)

Answer If Did you use an IWB during your school teaching career (pr... No Is Selected

Q43 Why not? (please select from the following)

- ❍ IWBs did not exist in the educational facilities at that time (1)
- ❍ IWBs existed, however I did not have the opportunity to use one (2)
- ❍ I saw an IWB being used but did not use it myself (3)
- ❍ IWBs existed, however I chose not use one when I had the opportunity (please explain why you chose not to) (4)

Answer If Did you use an IWB during your school teaching career (pr... Yes Is Selected

Q44 Please provide more information (select from the following)

- ❍ I saw an IWB being used but did not use it myself (1)
- ❍ An IWB was available and I often used one (2)
- ❍ An IWBs was available and I used one occasionally (3)
- ❍ An IWB was available but I rarely used one (please explain why you only used it rarely) (4) _____

Answer If Did you use an IWB, or see an IWB being used, during your... Yes Is Selected

Q45 In which subject area/s was an IWB used?

- ❍ Please list all areas applicable (1) _____

Answer If Did you use an IWB, or see an IWB being used, during your... Yes Is Selected

Q46 How was the IWB used? (select all relevant answers)

- ❑ Screen for projection (1)
- ❑ Preloading teaching pages (2)
- ❑ Dragging or hiding items (3)
- ❑ Colour, shading and highlighting items (4)
- ❑ Downloading images or sounds (5)
- ❑ Annotating displayed items (6)
- ❑ Saving work (7)
- ❑ Digitally record interactive learning sequences (8)
- ❑ Displaying student work (9)
- ❑ Revisiting materials (10)
- ❑ Downloading from network (11)
- ❑ Subject specific software (12)
- ❑ Search engine (13)
- ❑ Movement or animation (14)
- ❑ Subject websites (15)
- ❑ National curriculum materials (16)
- ❑ Other (please give details) (17) _____

Q47 Did you have specific training in the use of an IWB during your teaching career (pre-University level)?

- ❍ Yes (1)
- ❍ No (2)

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q48 Please indicate if, as a teacher, you were trained in any of the following basic features of IWBs (pre-University level) (select all that apply):

- ❑ Learnt to connect computer to IWB & operating projector (1)
- ❑ Familiarised with key IWB tools (2)
- ❑ Learnt to trouble-shoot common technical difficulties (3)

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q49 Please indicate if, as a teacher, you received training in either of the following (pre-University level):

- ❑ Familiarised with IWB dedicated software (provide details if possible) (1) _____
- ❑ Familiarised with IWB subject specific resources (provide details if possible) (2) _____

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q50 Please indicate if, as a teacher, you learnt how to do either of the following (pre-University level) (select all that apply):

- ❑ Locate suitable internet resources for use on an IWB (1)
- ❑ Import images, sounds and video clips for use on an IWB (2)

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q51 Please indicate if, as a teacher, you received training in any of the following pedagogies that support the use of an IWB (pre-University level) (select all that apply):

- ❑ Learnt how an IWB can support mixed learning styles (1)
- ❑ Learnt how to reinforce learning with an IWB (2)
- ❑ Learnt how to enhance student motivation with an IWB (3)
- ❑ Learnt how to incorporate an interactive teaching style (4)

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q52 Please indicate if, as a teacher, you received training in how to plan lessons using an IWB (pre-University level) (select all that apply):

- ❑ Learnt how an IWB can be used to re-cap previous lessons (1)
- ❑ Learnt how to create lesson sequences and diagrams (2)
- ❑ Learnt the value of a school based resource bank (3)
- ❑ Other (please explain) (4) _____

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q53 As a teacher (pre-University level), what type of professional learning did you receive (select all applicable answers)?

- ❑ Learning from external experts coming to school/s (1)
- ❑ Learning from recognised experts within the school community (2)
- ❑ Learning by asking colleagues for help (3)
- ❑ Learning by watching colleagues (4)
- ❑ Learning by self-exploration (5)
- ❑ Learning from students (6)
- ❑ Other (7) _____

Answer If Did you have specific training in the use of an IWB durin... No Is Selected

Q54 If not, please select one of the following:

- ❍ IWB training was not available (1)
- ❍ IWB training was available, however I did not have the opportunity to undertake it (please explain why not) (2) _____
- ❍ IWB training was available, however I chose not to do it (please explain why you chose not to) (3) _____

Q55 Have you used an IWB in your teaching at University?

- ❍ Yes (1)
- ❍ No (2)

Answer If Have you used an IWB in your teaching at University? No Is Selected

Q57 Please indicate why not (select from the following):

- ❑ IWBs are not on my campus at this time (1)
- ❑ An IWB is available, however I do not have the opportunity to use it (2)
- ❑ I have seen an IWB being used, however have not used it myself (3)
- ❑ An IWB is available, however I choose not to use it (4)
- ❑ Lack of time (5)
- ❑ Lack of training (6)
- ❑ Despite training, I don't know how (7)
- ❑ Not relevant to my subject area/s (8)
- ❑ Other (please explain) (9)

Answer If Have you used an IWB in your teaching at University? Yes Is Selected

Q58 In which subject area/s have you used an IWB?

- ❍ Please list subject areas (1) _____

Answer If Have you used an IWB in your teaching at University? Yes Is Selected

Q59 For what purpose have you used the IWB (select all applicable answers)?

- ❑ Screen for projection (1)
- ❑ Preloading teaching pages (2)
- ❑ Dragging or hiding items (3)
- ❑ Colour, shading and highlighting items (4)
- ❑ Downloading images or sounds (5)
- ❑ Annotating displayed items (6)
- ❑ Saving work (7)
- ❑ Digitally record interactive learning sequences (8)
- ❑ Displaying student work (9)
- ❑ Revisiting materials (10)
- ❑ Downloading from network (11)
- ❑ Subject specific software (12)
- ❑ Search engine (13)
- ❑ Movement or animation (14)
- ❑ Subject websites (15)
- ❑ National curriculum materials (16)
- ❑ Other (17) _____

Q60 Have you had specific training in the use of an IWB during your teaching at University?

- ❍ Yes (1)
- ❍ No (2)

Answer If Have you had specific training in the use of an IWB durin... Yes Is Selected

Q61 Please indicate what sort of IWB training you received whilst teaching at University (select all applicable answers):

- ❑ Learned to connect computer to IWB & operating projector (1)
- ❑ Familiarised with key IWB tools (2)
- ❑ Learnt to trouble-shoot common technical difficulties (3)
- ❑ Familiarised with IWB dedicated software (4)
- ❑ Familiarised with IWB subject specific resources (5)
- ❑ Learnt to locate suitable internet resources (6)
- ❑ Learnt to import images, sounds and video clips (7)
- ❑ Learnt how an IWB can support mixed learning styles (8)
- ❑ Learnt how to reinforce learning with an IWB (9)
- ❑ Learnt how to enhance student motivation with an IWB (10)
- ❑ Learnt how to incorporate an interactive teaching style (11)
- ❑ Planning with IWBs (12)
- ❑ Learnt how an IWB can be used to re-cap previous lessons (13)
- ❑ Learnt how to create lesson sequences and diagrams (14)
- ❑ Learnt the value of a school based resource bank (15)
- ❑ Other (16) _____
- ❑ None (17)

Answer If Have you had specific training in the use of an IWB durin... Yes Is Selected

Q62 From whom did you receive your IWB training at University (please select all that apply)?

- ❑ Learning from external experts coming to the University (1)
- ❑ Learning from recognised experts within the University community (2)
- ❑ Learning from asking colleagues for help (3)
- ❑ Learning from watching colleagues (4)
- ❑ Learning from self-exploration (5)
- ❑ Learning from students (6)
- ❑ Other (7) _____

Answer If Have you had specific training in the use of an IWB durin... No Is Selected

Q63 Please indicate why not

- ❍ IWB training was not available (1)
- ❍ IWB training was available, however I did not have the opportunity to undertake it (please explain) (2) _____
- ❍ IWB training was available, however I chose not to do it (please explain why not) (3) _____

Q95 Do you have access to an IWB when you are teaching?

- ❍ Yes (1)
- ❍ No (2)
- ❍ Sometimes (please explain) (3) _____

Q75 Do you think there is an expectation for you to use an IWB whilst teaching at University?

- ❍ Yes (1)
- ❍ No (2)
- ❍ Maybe (please explain) (3) _____

Q76 Do you believe you are capable of using an IWB effectively in your teaching at University?

- ❍ Yes (1)
- ❍ No (2)
- ❍ Maybe (please explain) (3) _____

Q96 Please describe an example of teaching with an IWB, as follows:

- ❑ Effective use: (1) _____
- ❑ Poor use: (2) _____

Q82 What do you think the benefits are of using an IWB as a teaching tool?

- ❑ Student engagement (1)
- ❑ Student motivation (2)
- ❑ Modern teaching (3)
- ❑ Organisational tool (4)
- ❑ Aligns with your teaching pedagogy (5)
- ❑ Capitalise on Internet resources (6)
- ❑ Utilise software to support teaching (7)
- ❑ Engage students with different learning styles (8)
- ❑ Supports teacher directed learning (9)
- ❑ Facilitates student directed learning (10)
- ❑ Flexibility in group teaching (11)
- ❑ Improves teacher's computer skills (12)
- ❑ Improves students' computer skills (13)
- ❑ Convenience in projecting items (14)
- ❑ None (15)
- ❑ Other (please explain) (16)

Q83 What drawbacks do you think there are in using an IWB as a teaching tool?

- ❑ Consumes extra preparation time (1)
- ❑ Consumes extra time learning new software (2)
- ❑ Waste of time (3)
- ❑ Technology is not reliable (4)
- ❑ Doesn't hold students' attention for long (5)
- ❑ Lack of IWB technology (6)
- ❑ Difficult to utilise with a large lecture group (7)
- ❑ None (8)
- ❑ Other (please explain) (9)

Q84 Do you believe the drawbacks you associate with using an IWB outweigh the benefits of this technology?

- ❍ Yes (1)
- ❍ No (2)

Q93 Please rank the following from 1-9, indicating your preferred style for learning to use an IWB? (drag and drop into order) (1 is the most preferred, 9 is the least preferred)

_____ Learning from external experts coming to University (1)

_____ Learning from recognised experts within the University community (2)

_____ Learning from asking colleagues for help (3)

_____ Learning from watching colleagues (4)

_____ Learning from self-exploration (5)

_____ Learning from students (6)

_____ Learning through video conferencing (7)

_____ Online learning (8)

_____ Other (9)

Q64 The last part of the survey relates to how you respond to IWBs, as well as your teaching pedagogy, using a 5 point Likert Scale (select from 'Strongly Agree, Agree, Unsure, Disagree, Strongly Disagree' for each statement) The sections are: 1. Perceived usefulness 2. Attitude towards computer use 3. Computer self-efficacy 4. Perceived ease of use 5. Technological complexity 6. Facilitating conditions 7. Teaching pedagogy

Q65 Perceived usefulness of IWBs

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. An IWB is a useful teaching tool (1)	❍	❍	❍	❍	❍
b. IWBs are not suitable for my teaching area (2)	❍	❍	❍	❍	❍
c. It is difficult to think of ways to use an IWB (3)	❍	❍	❍	❍	❍
d. Using an IWB as a teaching tool will make me a better teacher (4)	❍	❍	❍	❍	❍
e. Using an IWB will not improve my teaching (5)	❍	❍	❍	❍	❍
f. Knowing how to use an IWB will not assist my career (6)	❍	❍	❍	❍	❍
g. IWBs are just a passing fad (7)	❍	❍	❍	❍	❍
h. IWBs make it easier to re-cap teaching points (8)	❍	❍	❍	❍	❍

Q66 Attitude towards IWB use

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. There are better teaching tools than IWBs (1)	❍	❍	❍	❍	❍
b. I like using IWBs (2)	❍	❍	❍	❍	❍
c. I do not favour using IWBs in my teaching (3)	❍	❍	❍	❍	❍
d. IWBs are an important teaching tool (4)	❍	❍	❍	❍	❍
e. IWBs are of no interest to me (5)	❍	❍	❍	❍	❍
f. It is important to utilise an IWB in my teaching (6)	❍	❍	❍	❍	❍
g. Good IWB skills are an important component of teaching (7)	❍	❍	❍	❍	❍
h. My teaching will appear more up to date if I use an IWB (8)	❍	❍	❍	❍	❍

Q67 IWB self-efficacy

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. I believe I have the skills needed for using an IWB effectively (1)	❍	❍	❍	❍	❍
b. IWBs frustrate me (2)	❍	❍	❍	❍	❍
c. I could use an IWB if I could get help when I got stuck (3)	❍	❍	❍	❍	❍
d. I possess inadequate IWB skills to teach with one (4)	❍	❍	❍	❍	❍
e. Using an IWB makes me nervous and uncomfortable (5)	❍	❍	❍	❍	❍
f. I am confident I can use an IWB (6)	❍	❍	❍	❍	❍
g. I dread using an IWB (7)	❍	❍	❍	❍	❍
h. I could learn to use an IWB if someone showed me how to do it first (8)	❍	❍	❍	❍	❍

Q68 Perceived ease of use of IWBs

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. IWBs are easy to use (1)	❍	❍	❍	❍	❍
b. IWBs make it easier to improvise lessons (2)	❍	❍	❍	❍	❍
c. IWBs are not worth the effort needed to use them (3)	❍	❍	❍	❍	❍
d. I would be more organised if I used an IWB (4)	❍	❍	❍	❍	❍
e. IWBs are difficult to use (5)	❍	❍	❍	❍	❍
f. IWBs are too hard to bother with (6)	❍	❍	❍	❍	❍
g. IWBs are simple and unchallenging (7)	❍	❍	❍	❍	❍
h. Lessons involving IWBs take longer to prepare (8)	❍	❍	❍	❍	❍

Q69 Technological complexity of IWBs

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. I think I am good at using an IWB (1)	❍	❍	❍	❍	❍
b. Trouble-shooting IWB issues is difficult (2)	❍	❍	❍	❍	❍
c. I find problem-solving IWB issues easy (3)	❍	❍	❍	❍	❍
d. IWBs are too complex to use (4)	❍	❍	❍	❍	❍
e. I don't think I am good at using an IWB (5)	❍	❍	❍	❍	❍
f. I struggle to use an IWB well (6)	❍	❍	❍	❍	❍
g. It takes too long to learn how to use an IWB (7)	❍	❍	❍	❍	❍
h. Using an IWB takes too much planning time (8)	❍	❍	❍	❍	❍

Q70 Facilitating conditions for using IWBs

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. Support is readily available for using IWBs (1)	❍	❍	❍	❍	❍
b. The available IWB software suits my teaching needs (2)	❍	❍	❍	❍	❍
c. IWBs are not reliable and tend to break down (3)	❍	❍	❍	❍	❍
d. There is always an IWB available for me to use (4)	❍	❍	❍	❍	❍
e. I am encouraged to use an IWB (5)	❍	❍	❍	❍	❍
f. There are useful peripheral items I can use in conjunction with an IWB (6)	❍	❍	❍	❍	❍
g. I have seen how other University staff members use IWBs (7)	❍	❍	❍	❍	❍
h. I have time to learn how to use an IWB (8)	❍	❍	❍	❍	❍

Q71 Teaching pedagogy

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. IWBs help students learn (1)	❍	❍	❍	❍	❍
b. I will need to change my teaching pedagogy to use an IWB (2)	❍	❍	❍	❍	❍
c. It is difficult to think of ways to use an IWB (3)	❍	❍	❍	❍	❍
d. My teaching style will not need to change when I use an IWB (4)	❍	❍	❍	❍	❍
e. IWB support mixed learning styles, e.g. visual, kinetic (5)	❍	❍	❍	❍	❍
f. Students are more motivated in their learning through an IWB (6)	❍	❍	❍	❍	❍
g. My teaching style does not suit the use of an IWB (7)	❍	❍	❍	❍	❍
h. Students do not like	❍	❍	❍	❍	❍

using an IWB (8)					

Q86 Is there anything else you would like to add?

- ❍ Yes (1) _____
- ❍ No (2)

Q72 If you are willing to be interviewed about some of the issues raised in the survey in the next stage of this study, please provide your name and email address below. If you choose to participate in the interview and are selected for the study, you will be contacted via the email address you provide.

- ❑ Name (if you are willing to be interviewed) (1) _____
- ❑ Email (2) _____

Q73 Thank you very much for giving your time to this study.

Appendix F

Pre-Service Teacher Survey

Pre-Service Teacher Survey

Q1 The first part of this survey gathers statistical information

Q2 Please approximate what percentage of your Bachelor of Education program you have undertaken through each UTAS Campus (please make sure the total is less than or equal to 100%):

_____ The Sandy Bay Campus (Hobart) (1)

_____ The Newnham Campus (Launceston) (2)

_____ The Cradle Campus (Burnie) (3)

_____ Other (4)

Q3 In which year of your Teacher Education studies are you?

- 1st year (1)
- 2nd year (2)
- 3rd year (3)
- 4th year (4)

Q4 Please indicate your gender:

- Male (1)
- Female (2)

Q5 Please indicate your age group:

- 18-25 (1)
- 26-30 (2)
- 31-40 (3)
- 41-50 (4)
- 51-60 (5)
- 61+ (6)

Q6 Please indicate if you have experience with any of the following types of technologies:

- ❑ Interactive Whiteboard/eBoard (1)
- ❑ Data Projector (2)
- ❑ Calculator (3)
- ❑ CD/DVD (4)
- ❑ Video Recorder (5)
- ❑ Hard Disk Drive (6)
- ❑ Mobile Phone (7)
- ❑ IPad (and the like) (8)
- ❑ IPod/Mp3 (or the like) (9)
- ❑ Personal Computer (10)
- ❑ Laptop (11)
- ❑ Apple Mac Computer (12)
- ❑ Tablet (13)
- ❑ Netbook (14)
- ❑ Printer (15)
- ❑ Scanner (16)
- ❑ Webcam (17)
- ❑ Robotics (18)
- ❑ GPS (19)
- ❑ Other (20)

Q7 Please indicate if you have experience with any of the following types of software applications:

- ❑ Internet Explorer (or similar web browser) (1)
- ❑ Word (or similar word processor) (2)
- ❑ Skype (or similar internet phone) (3)
- ❑ Email (4)
- ❑ Movie Maker (or similar movie editing software) (5)
- ❑ PowerPoint (or similar presentation software) (6)
- ❑ Excel (or similar spreadsheet software) (7)
- ❑ Access database (or similar database software) (8)
- ❑ Publisher (or similar design software) (9)
- ❑ Paint (or similar graphics software) (10)
- ❑ Photostory 3 (11)
- ❑ Photoshop (or similar photo editing software) (12)
- ❑ Other (13) _____
- ❑ None (14)

Q8 Are you confident using technology?

- ❍ Yes (1)
- ❍ No (2)
- ❍ Usually (3)
- ❍ Sometimes (4)

Q9 Approximately how many years have you been using a computer?

- 1-2 Year (1)
- 3-5 Years (2)
- 6-10 Years (3)
- 11-15 Years (4)
- 16-20 Years (5)
- 21-30 Years (6)
- 31+ Years (7)

Q10 What year did you first access a computer?

- Pre 1991 (1)
- 1991-2000 (2)
- 2001-2005 (3)
- 2006-2008 (4)
- 2009 (5)
- 2010 (6)
- 2011 (7)

Q11 When did you start using a computer on a regular basis, i.e. at least once a week?

- Pre 1991 (1)
- 1991-2000 (2)
- 2001-2005 (3)
- 2006-2008 (4)
- 2009 (5)
- 2010 (6)
- 2011 (7)

Q12 Do you use a computer, laptop, smart phone or other handheld device at home?

- ❍ Yes (1)
- ❍ No (2)

Answer If Do you use a computer, laptop, smart phone or other handh... Yes Is Selected

Q13 For what purpose/s do you use your computer at home (select all that apply)?

- ❑ Check email (1)
- ❑ Internet resources (2)
- ❑ Social networking (3)
- ❑ Entertainment (4)
- ❑ Work preparation (5)

Answer If Do you use a computer, laptop, smart phone or other handh... Yes Is Selected

Q14 Approximately how many hours per week do you use your computer at home in total?

- ❍ 0-1 (1)
- ❍ 2-4 (2)
- ❍ 5-10 (3)
- ❍ 10-20 (4)
- ❍ 20-30 (5)
- ❍ 30+ (6)

Answer If Do you use a computer, laptop, smart phone or other handh... No Is Selected

Q15 Why not?

- ❍ Please explain (1) _____

Q16 Do you use a computer, laptop, smart phone or other handheld computing device at University?

- ❍ Yes (1)
- ❍ No (2)

Answer If Do you use a computer, laptop, smart phone or other handh... Yes Is Selected

Q17 For what purpose/s do you use a computer at UTAS (select all that apply)?

- ❑ Check email (1)
- ❑ Internet resources (2)
- ❑ Social networking (3)
- ❑ Entertainment (4)
- ❑ Study preparation (5)

Answer If Do you use a computer, laptop, smart phone or other handh... Yes Is Selected

Q18 Approximately how many hours per week do you use a computer at UTAS in total?

- ❍ 0-1 (1)
- ❍ 2-4 (2)
- ❍ 5-10 (3)
- ❍ 10-20 (4)
- ❍ 20-30 (5)
- ❍ 30+ (6)

Answer If Do you use a computer, laptop, smart phone or other handh... No Is Selected

Q19 Why not?

- ❍ Please Explain (1) _____

Q20 Have you used an Interactive Whiteboard (IWB) during your teacher education course to date (not including professional experience/s)?

- Yes (1)
- No (2)

Answer If Have you used an IWB during your teacher education course... No Is Selected

Q21 Why not? (please select the applicable)

- IWBs do not exist in educational facilities at this time (1)
- There is an IWB but I have not had the opportunity to use it (2)
- I saw an IWB being used but did not use it myself (3)
- There is an IWB but I have chosen not to use it (4)
- If you have chosen not to use an IWB, please explain why you made this choice (5)

  _____

Answer If Have you used an IWB during your teacher education course... Yes Is Selected

Q22 How often have you used it?

- Rarely (1)
- Occasionally (2)
- Often (3)

Q23 Have you seen an IWB used during your teacher education course?

- Yes (1)
- No (2)

Answer If Have you seen an IWB used during your teacher education c... No Is Selected

Q24 Please indicate from the following:

- There was not an IWB in educational facilities at this time (1)
- There was an IWB but I have not seen it used (2)

Answer If Have you seen an IWB used during your teacher education c... Yes Is Selected

Q25 In which of your course subject areas has an IWB been used?

- Please list all applicable courses (1) _____

Answer If Have you seen an IWB used during your teacher education c... Yes Is Selected

Q26 How has the IWB been used? (please select all that are applicable)

- ❑ Screen for projection (1)
- ❑ Preloading teaching pages (2)
- ❑ Dragging or hiding items (3)
- ❑ Colour, shading and highlighting items (4)
- ❑ Downloading images or sounds (5)
- ❑ Annotating displayed items (6)
- ❑ Saving work (7)
- ❑ Digitally record interactive learning sequences (8)
- ❑ Displaying student work (9)
- ❑ Revisiting materials (10)
- ❑ Downloading from internet (11)
- ❑ Subject specific software (12)
- ❑ Search engine (13)
- ❑ Movement or animation (14)
- ❑ Subject websites (15)
- ❑ National curriculum materials (16)
- ❑ Other (17) _____

Q27 Have you received training in the use of an IWB during your teacher education so far?

- ❍ Yes (1)
- ❍ No (2)

Answer If Have you received training in the use of an IWB during yo... Yes Is Selected

Q28 Please indicate if you have learned IWB skills from any of the following soures:

- ❑ Learning from external experts coming to class/es (1)
- ❑ Learning from recognised experts within the University community (2)
- ❑ Learning by asking peers for help (3)
- ❑ Learning by watching peers (4)
- ❑ Learning by self-exploration (5)
- ❑ Learning by watching University staff use it in their teaching (6)
- ❑ Other (7) _____

Answer If Have you received training in the use of an IWB during yo... Yes Is Selected

Q29 Please indicate if you have been trained in any of the following basic features of IWBs:

- ❑ Learnt to connect computer to IWB & operating projector (1)
- ❑ Familiarisation with key IWB tools (2)
- ❑ Learnt to trouble-shoot common technical difficulties (3)

Answer If Have you received training in the use of an IWB during yo... Yes Is Selected

Q30 Please indicate if you have received training in either of the following :

- ❑ Familiarisation with IWB dedicated software (provide details if possible) (1)

  _____
- ❑ Familiarisation with IWB subject specific resources (provide details if possible) (2)

  _____

Answer If Have you received training in the use of an IWB during yo... Yes Is Selected

Q31 Please indicate if you have learnt how to:

- ❑ Locate suitable internet resources for use on an IWB (1)
- ❑ Import images, sounds and video clips for use on an IWB (2)

Answer If Have you received training in the use of an IWB during yo... Yes Is Selected

Q32 Please indicate if you have training in any of the following pedagogies that support the use of an IWB

- ❑ Learnt how to use an IWB to support mixed learning styles (1)
- ❑ Learnt how to reinforce learning with an IWB (2)
- ❑ Learnt how to enhance student motivation with an IWB (3)
- ❑ Learnt how to incorporate an interactive teaching style (4)

Answer If Have you received training in the use of an IWB during yo... Yes Is Selected

Q33 Please indicate if you have received training in how to plan lessons using an IWB

- ❑ Learnt how an IWB can be used to re-cap previous lessons (1)
- ❑ Learnt how to create lesson sequences and diagrams (2)
- ❑ Learnt the value of a school based resource bank (3)
- ❑ Other (please explain) (4) _____

Answer If Have you received training in the use of an IWB during yo... No Is Selected

Q34 If you haven't received any IWB training, please indicate why:

- ❍ IWB training has not been available (1)
- ❍ IWB training has been available, however I did not have the opportunity to undertake it (2)
- ❍ IWB training was available, however I chose not to do it - please explain why (3) _____

Q35 Did you use an IWB, or see an IWB being used, during your classroom professional experience/s?

- ❍ Yes (1)
- ❍ No (2)

Answer If Did you use an IWB, or see an IWB being used, during your... No Is Selected

Q36 Why not? (please select from the following)

- ❍ IWBs did not exist in the schools where I have done professional experience (1)
- ❍ IWBs existed, however I did not see a teacher or student using one (2)
- ❍ IWBs existed, however I did not have the opportunity to use one (3)
- ❍ IWBs existed, however I chose not use one when I had the opportunity (please explain why you chose not to) (4) _____

Answer If Did you use an IWB, or see an IWB being used, during your... Yes Is Selected

Q37 Please provide more information (select from the following)

- ❑ I saw a teacher using one (1)
- ❑ I saw students using one (2)
- ❑ An IWB was available and I often used one (3)
- ❑ An IWBs was available and I used one occasionally (4)
- ❑ An IWB was available but I rarely used one (please explain why you only used it rarely) (5) _____

Answer If Did you use an IWB, or see an IWB being used, during your... Yes Is Selected

Q38 In which subject area/s was an IWB used?

- ❍ Please list all areas applicable (1) _____

Answer If Did you use an IWB, or see an IWB being used, during your... Yes Is Selected

Q39 How was the IWB used? (select all relevant answers)

- ❑ Screen for projection (1)
- ❑ Preloading teaching pages (2)
- ❑ Dragging or hiding items (3)
- ❑ Colour, shading and highlighting items (4)
- ❑ Downloading images or sounds (5)
- ❑ Annotating displayed items (6)
- ❑ Saving work (7)
- ❑ Digitally record interactive learning sequences (8)
- ❑ Displaying student work (9)
- ❑ Revisiting materials (10)
- ❑ Downloading from network (11)
- ❑ Subject specific software (12)
- ❑ Search engine (13)
- ❑ Movement or animation (14)
- ❑ Subject websites (15)
- ❑ National curriculum materials (16)
- ❑ Other (please give details) (17) _____

Q40 Did you have specific training in the use of an IWB during your classroom professional experience/s?

- ❍ Yes (1)
- ❍ No (2)

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q41 Please indicate if you were trained in any of the following basic features of IWBs:

- ❑ Learnt to connect computer to IWB & operating projector (1)
- ❑ Familiarised with key IWB tools (2)
- ❑ Learnt to trouble-shoot common technical difficulties (3)

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q42 Please indicate if you have received training in either of the following:

- ❑ Familiarised with IWB dedicated software (provide details if possible) (1)

  _____
- ❑ Familiarised with IWB subject specific resources (provide details if possible) (2)

  _____

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q43 Please indicate if you have learnt how to:

- ❑ Locate suitable internet resources for use on an IWB (1)
- ❑ Import images, sounds and video clips for use on an IWB (2)

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q44 Please indicate if you have training in any of the following pedagogies that support the use of an IWB:

- ❑ Learnt how an IWB can support mixed learning styles (1)
- ❑ Learnt how to reinforce learning with an IWB (2)
- ❑ Learnt how to enhance student motivation with an IWB (3)
- ❑ Learnt how to incorporate an interactive teaching style (4)

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q45 Please indicate if you have received training in how to plan lessons using an IWB:

- ❑ Learnt how an IWB can be used to re-cap previous lessons (1)
- ❑ Learnt how to create lesson sequences and diagrams (2)
- ❑ Learnt the value of a school based resource bank (3)
- ❑ Other (please explain) (4) _____

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q46 What type of professional learning did you receive?

- ❑ Learning from external experts coming to school/s (1)
- ❑ Learning from recognised experts within the school community (2)
- ❑ Learning by asking colleagues for help (3)
- ❑ Learning by watching colleagues (4)
- ❑ Learning by self-exploration (5)
- ❑ Learning from students (6)
- ❑ Other (7) _____

Answer If Did you have specific training in the use of an IWB durin... No Is Selected

Q47 If not, please select one of the following

- ❍ IWB training was not available (1)
- ❍ IWB training was available, however I did not have the opportunity to undertake it (2)
- ❍ IWB training was available, however I chose not to do it (please explain why you chose not to) (3) _____

Q48 Have you worked or volunteered in a school classroom before or during your teacher education course (not including practicum experiences)?

- ❍ Yes (1)
- ❍ No (2)

Answer If Have you worked or volunteered in a school classroom befo... Yes Is Selected

Q49 Did you use or see an IWB being used during the time you spent volunteering or working in a school?

- ❍ Yes (1)
- ❍ No (2)

Answer If Did you use or see an IWB being used during your school p... No Is Selected

Q50 Please indicate why you did not see an IWB being used during this period

- ❍ IWBs did not exist in educational facilities at this time (1)
- ❍ IWBs existed and may have been used, but I did not see a teacher or student using one (2)
- ❍ Other (3) _____

Answer If Did you use or see an IWB being used during your school p... Yes Is Selected

Q51 In which subject area/s was an IWB used?

- ❍ Please list subject areas (1) _____

Answer If Did you use or see an IWB being used during your school p... Yes Is Selected

Q52 How was the IWB used? (select all applicable answers)

- ❑ Screen for projection (1)
- ❑ Preloading teaching pages (2)
- ❑ Dragging or hiding items (3)
- ❑ Colour, shading and highlighting items (4)
- ❑ Downloading images or sounds (5)
- ❑ Annotating displayed items (6)
- ❑ Saving work (7)
- ❑ Digitally record interactive learning sequences (8)
- ❑ Displaying student work (9)
- ❑ Revisiting materials (10)
- ❑ Downloading from network (11)
- ❑ Subject specific software (12)
- ❑ Search engine (13)
- ❑ Movement or animation (14)
- ❑ Subject websites (15)
- ❑ National curriculum materials (16)
- ❑ Other (17) _____

Answer If Did you use or see an IWB being used during your school p... Yes Is Selected

Q53 Did you learn how to use an IWB during the time you spent volunteering or working in a school?

- ❍ Yes (1)
- ❍ No (2)

Answer If Did you learn how to use an IWB during the time you ... Yes Is Selected

Q54 Please indicate what sort of IWB training you received during the time you spent volunteering or working in a school

- ❑ Learned to connect computer to IWB & operating projector (1)
- ❑ Familiarised with key IWB tools (2)
- ❑ Learnt to trouble-shoot common technical difficulties (3)
- ❑ Familiarised with IWB dedicated software (4)
- ❑ Familiarised with IWB subject specific resources (5)
- ❑ Learnt to locate suitable internet resources (6)
- ❑ Learnt to import images, sounds and video clips (7)
- ❑ Learnt how an IWB can support mixed learning styles (8)
- ❑ Learnt how to reinforce learning with an IWB (9)
- ❑ Learnt how to enhance student motivation with an IWB (10)
- ❑ Learnt how to incorporate an interactive teaching style (11)
- ❑ Planning with IWBs (12)
- ❑ Learnt how an IWB can be used to re-cap previous lessons (13)
- ❑ Learnt how to create lesson sequences and diagrams (14)
- ❑ Learnt the value of a school based resource bank (15)
- ❑ Other (16) _____
- ❑ None (17)

Answer If Did you learn how to use an IWB during the time you ... Yes Is Selected

Q55 From whom did you receive your training?

- ❑ Learning from external experts coming to school/s (1)
- ❑ Learning from recognised experts within the school community (2)
- ❑ Learning from asking colleagues for help (3)
- ❑ Learning from watching colleagues (4)
- ❑ Learning from self-exploration (5)
- ❑ Learning from students (6)
- ❑ Other (7) _____

Answer If Did you learn how to use an IWB during your school v... No Is Selected

Q56 Please indicate why not

- ❍ IWB training was not available (1)
- ❍ IWB training was available, however I did not have the opportunity to undertake it (2)
- ❍ IWB training was available, however I chose not to do it (please explain why not) (3)

  _____

Q57 Were IWBs used in any of the schools you attended as a Primary or Secondary School student?

- ❍ Yes (1)
- ❍ No (2)

Answer If Were IWBs used when you were a Primary or Secondary ... No Is Selected

Q58 Why not? (please select from the following)

- ❍ IWBs did not exist in educational facilities at this time (1)
- ❍ IWBs existed, however I did not see a teacher or student using one (2)
- ❍ IWBs existed, however I did not have the opportunity to use one (3)
- ❍ IWBs existed, however I chose not use one when I had the opportunity (please explain why) (4) _____

Answer If Were IWBs used in any of the schools you attended as ... Yes Is Selected

Q59 Please select one of the following

- ❍ IWBs existed and I saw a teacher using one (1)
- ❍ IWBs existed and I saw students using one (2)
- ❍ An IWB was available and I often used one (3)
- ❍ An IWBs was available and I used one occasionally (4)
- ❍ An IWB was available but I rarely used one (please explain why) (5) _____

Answer If Were IWBs used in any of the schools you attended as ... Yes Is Selected

Q60 In which subject area/s was an IWB used?

- ❍ Please list all relevant areas (1) _____

Answer If Were IWBs used in any of the schools you attended as ... Yes Is Selected

Q61 How was the IWB used? (select all relevant options)

- ❑ Screen for projection (1)
- ❑ Preloading teaching pages (2)
- ❑ Dragging or hiding items (3)
- ❑ Colour, shading and highlighting items (4)
- ❑ Downloading images or sounds (5)
- ❑ Annotating displayed items (6)
- ❑ Saving work (7)
- ❑ Digitally record interactive learning sequences (8)
- ❑ Displaying student work (9)
- ❑ Revisiting materials (10)
- ❑ Downloading from network (11)
- ❑ Subject specific software (12)
- ❑ Search engine (13)
- ❑ Movement or animation (14)
- ❑ Subject websites (15)
- ❑ National curriculum materials (16)
- ❑ Other (please explain) (17) _____

Q62 Do you believe you will be expected to use an IWB when you gain a teaching position?

- ❍ Yes (1)
- ❍ No (2)
- ❍ Maybe (please explain) (3) _____

Answer If Do you believe you will be expected to use an IWB when yo... Yes Is Selected Or Do you believe you will be expected to use an IWB when yo... Maybe (please explain) Is Selected

Q63 Do you believe you will be capable of using an IWB effectively when you gain a teaching position?

- ❍ Yes (1)
- ❍ No (2)
- ❍ Maybe (please explain) (3) _____

Q64 What do you think the benefits are of using an IWB as a teaching tool?

- ❑ Student engagement (1)
- ❑ Student motivation (2)
- ❑ Modern teaching (3)
- ❑ Organisational tool (4)
- ❑ Aligns with your teaching pedagogy (5)
- ❑ Capitalise on Internet resources (6)
- ❑ Utilise software to support teaching (7)
- ❑ Engage students with different learning styles (8)
- ❑ Supports teacher directed learning (9)
- ❑ Facilitates student directed learning (10)
- ❑ Flexibility in group teaching (11)
- ❑ Improves teacher's computer skills (12)
- ❑ Improves students' computer skills (13)
- ❑ Convenience in projecting items (14)
- ❑ None (15)
- ❑ Other (please explain) (16)

Q65 What drawbacks do you think there are in using an IWB as a teaching tool?

- ❑ Consumes extra preparation time (1)
- ❑ Consumes extra time learning new software (2)
- ❑ Waste of time (3)
- ❑ Technology is not reliable (4)
- ❑ Doesn't hold students' attention for long (5)
- ❑ None (6)
- ❑ Other (please explain) (7)
- ❑

Q66 Do you believe the drawbacks you associate with using an IWB outweigh the benefits of this technology?

- ❍ Yes (1)
- ❍ No (2)

Q67 The last part of the survey relates to how you respond to IWBs, as well as your teaching pedagogy, using a 5 point Likert Scale (select from 'Strongly Agree, Agree, Unsure, Disagree, Strongly Disagree' for each statement) The sections are: 1. Perceived usefulness 2. Attitude towards computer use 3. Computer self-efficacy 4. Perceived ease of use 5. Technological complexity 6. Facilitating conditions 7. Teaching pedagogy

Q68 Perceived usefulness of IWBs

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. An IWB is a useful teaching tool (1)	❍	❍	❍	❍	❍
b. IWBs are not suitable for my intended teaching area (2)	❍	❍	❍	❍	❍
c. It is difficult to think of ways to use an IWB (3)	❍	❍	❍	❍	❍
d. Using an IWB as a teaching tool will make me a better teacher (4)	❍	❍	❍	❍	❍
e. Using an IWB will not improve my teaching (5)	❍	❍	❍	❍	❍
f. Knowing how to use an IWB will not assist my career (6)	❍	❍	❍	❍	❍
g. IWBs are just a passing fad (7)	❍	❍	❍	❍	❍
h. IWBs make it easier to re-cap teaching points (8)	❍	❍	❍	❍	❍

Q69 Attitude towards IWB use

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. There are better teaching tools than IWBs (1)	❍	❍	❍	❍	❍
b. I like using IWBs (2)	❍	❍	❍	❍	❍
c. I do not favour using IWBs in my teaching (3)	❍	❍	❍	❍	❍
d. IWBs are an important teaching tool (4)	❍	❍	❍	❍	❍
e. IWBs are of no interest to me (5)	❍	❍	❍	❍	❍
f. It is important to utilise an IWB in my teaching (6)	❍	❍	❍	❍	❍
g. Good IWB skills are an important component of teaching (7)	❍	❍	❍	❍	❍
h. My teaching will appear more up to date if I use an IWB (8)	❍	❍	❍	❍	❍

Q70 IWB self-efficacy

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. I believe I have the skills needed for using an IWB effectively (1)	❍	❍	❍	❍	❍
b. IWBs frustrate me (2)	❍	❍	❍	❍	❍
c. I could use an IWB if I knew help was available if I had trouble (3)	❍	❍	❍	❍	❍
d. I possess inadequate IWB skills to teach with one (4)	❍	❍	❍	❍	❍
e. Using an IWB makes me nervous and uncomfortable (5)	❍	❍	❍	❍	❍
f. I am confident I can use an IWB (6)	❍	❍	❍	❍	❍
g. I dread using an IWB (7)	❍	❍	❍	❍	❍
h. I could learn to use an IWB if someone showed me how to do it first (8)	❍	❍	❍	❍	❍

Q71 Perceived ease of use of IWBs

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. IWBs are easy to use (1)	❍	❍	❍	❍	❍
b. IWBs make it easier to improvise lessons (2)	❍	❍	❍	❍	❍
c. IWBs are not worth the effort needed to use them (3)	❍	❍	❍	❍	❍
d. I will be more organised if I use an IWB (4)	❍	❍	❍	❍	❍
e. IWBs are difficult to use (5)	❍	❍	❍	❍	❍
f. IWBs are too hard to bother with (6)	❍	❍	❍	❍	❍
g. IWBs are simple and unchallenging (7)	❍	❍	❍	❍	❍
h. Lessons involving IWBs take longer to prepare (8)	❍	❍	❍	❍	❍

Q72 Technological complexity of IWBs

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. I think I am good at using an IWB (1)	❍	❍	❍	❍	❍
b. Trouble-shooting IWB issues is difficult (2)	❍	❍	❍	❍	❍
c. I find problem-solving IWB issues easy (3)	❍	❍	❍	❍	❍
d. IWBs are too complex to use (4)	❍	❍	❍	❍	❍
e. I don't think I am good at using an IWB (5)	❍	❍	❍	❍	❍
f. I struggle to use an IWB well (6)	❍	❍	❍	❍	❍
g. It takes too long to learn how to use an IWB (7)	❍	❍	❍	❍	❍
h. Using an IWB takes too much planning time (8)	❍	❍	❍	❍	❍

Q73 Facilitating conditions for using IWBs

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. Support is readily available for using IWBs (1)	❍	❍	❍	❍	❍
b. The IWB software suits my intended teaching area (2)	❍	❍	❍	❍	❍
c. IWBs are not reliable and tend to break down (3)	❍	❍	❍	❍	❍
d. There is always an IWB available for me to use (4)	❍	❍	❍	❍	❍
e. I am encouraged to use an IWB (5)	❍	❍	❍	❍	❍
f. There are useful peripheral items I can use in conjunction with an IWB (6)	❍	❍	❍	❍	❍
g. I have seen how University staff members use IWBs (7)	❍	❍	❍	❍	❍
h. I have time to learn how to use an IWB (8)	❍	❍	❍	❍	❍

Q74 Teaching pedagogy

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. IWBs help students learn (1)	❍	❍	❍	❍	❍
b. I will need to change my teaching pedagogy when using an IWB (2)	❍	❍	❍	❍	❍
c. It is difficult to think of ways to use an IWB (3)	❍	❍	❍	❍	❍
d. My teaching style will not need to change when I use an IWB (4)	❍	❍	❍	❍	❍
e. IWBs support mixed learning styles, e.g. visual, kinetic (5)	❍	❍	❍	❍	❍
f. Students are more motivated in their learning through an IWB (6)	❍	❍	❍	❍	❍
g. My teaching style does not suit the use of an IWB (7)	❍	❍	❍	❍	❍
h. Students do not like	❍	❍	❍	❍	❍

using an IWB (8)					

Q75 Is there anything else you would like to add?

- ❍ Yes (1) _____
- ❍ No (2)

Q76 If you are willing to be interviewed about some of the issues raised in the survey in the next stage of this study, please provide your name and email address below. If you choose to participate in the interview and are selected for the study, you will be contacted via the email address you provide.

- ❑ Name (if you are willing to be interviewed) (1) _____
- ❑ Email (2) _____

Q77 Thank you very much for giving your time to this study.

Appendix G

Primary School Teacher Survey

Primary School Teaching Staff Survey

Q1 The first part of this survey gathers statistical information

Q2 Category of Employment:
- ❍ Contract (1)
- ❍ Permanent (2)
- ❍ Other (please explain) (3) _____

Q3 Please indicate your gender:
- ❍ Male (1)
- ❍ Female (2)

Q4 Please indicate your age group:
- ❍ 18-25 (1)
- ❍ 26-30 (2)
- ❍ 31-40 (3)
- ❍ 41-50 (4)
- ❍ 51-60 (5)
- ❍ 61+ (6)

Q5 Please indicate if you have experience with any of the following types of technologies:

- ❑ Interactive Whiteboard/eBoard (1)
- ❑ Data Projector (2)
- ❑ Calculator (3)
- ❑ CD/DVD (4)
- ❑ Video Recorder (5)
- ❑ HDD (6)
- ❑ Mobile Phone (7)
- ❑ IPad (and the like) (8)
- ❑ IPod/Mp3 (or the like) (9)
- ❑ Personal Computer (10)
- ❑ Laptop (11)
- ❑ Apple Mac Computer (12)
- ❑ Tablet (13)
- ❑ Netbook (14)
- ❑ Printer (15)
- ❑ Scanner (16)
- ❑ Webcam (17)
- ❑ Robotics (18)
- ❑ GPS (19)
- ❑ Other (20) _____

Q6 Please indicate if you have experience with any of the following types of software applications:

- ❑ Internet Explorer (or similar web browser) (1)
- ❑ Word (or similar word processor) (2)
- ❑ Skype (or similar internet phone) (3)
- ❑ Email (4)
- ❑ Movie Maker (or similar movie editing software) (5)
- ❑ PowerPoint (or similar presentation software) (6)
- ❑ Excel (or similar spreadsheet software) (7)
- ❑ Access database (or similar database software) (8)
- ❑ Publisher (or similar design software) (9)
- ❑ Paint (or similar graphics software) (10)
- ❑ Photostory 3 (11)
- ❑ Photoshop (or similar photo editing software) (12)
- ❑ Other (13) _____
- ❑ None (14)

Q85 Are you confident using technology?

- ❍ Yes (1)
- ❍ No (2)
- ❍ Usually (3)
- ❍ Sometimes (4)

Q7 Approximately how many years have you been using a computer?
- ❍ 1-2 Year (1)
- ❍ 3-5 Years (2)
- ❍ 6-10 Years (3)
- ❍ 11-15 Years (4)
- ❍ 16-20 Years (5)
- ❍ 21-30 Years (6)
- ❍ 31+ Years (7)

Q8 What year did you first access a computer?
- ❍ Pre 1991 (1)
- ❍ 1991-2000 (2)
- ❍ 2001-2005 (3)
- ❍ 2006-2008 (4)
- ❍ 2009 (5)
- ❍ 2010 (6)
- ❍ 2011 (7)

Q9 When did you start using a computer on a regular basis, i.e. at least once a week?
- ❍ Pre 1991 (1)
- ❍ 1991-2000 (2)
- ❍ 2001-2005 (3)
- ❍ 2006-2008 (4)
- ❍ 2009 (5)
- ❍ 2010 (6)
- ❍ 2011 (7)

Q10 Do you use a computer, laptop, smart phone or other handheld device at home?
- ❍ Yes (1)
- ❍ No (2)

Answer If Do you use a computer, laptop, smart phone or other handh... Yes Is Selected

Q11 For what purpose/s do you use your computer at home (select all that apply)?
- ❑ Check email (1)
- ❑ Internet resources (2)
- ❑ Social networking (3)
- ❑ Entertainment (4)
- ❑ Work preparation (5)

Answer If Do you use a computer, laptop, smart phone or other handh... Yes Is Selected

Q16 Approximately how many hours per week do you use your computer at home in total?
- ❍ 0-1 (1)
- ❍ 2-4 (2)
- ❍ 5-10 (3)
- ❍ 10-20 (4)
- ❍ 20-30 (5)
- ❍ 30+ (6)

Answer If Do you use a computer, laptop, smart phone or other handh... No Is Selected

Q17 Why not?
- ❍ Please explain (1) _____

Q18 Do you use a computer, laptop, smart phone or other handheld computing device at the school in which you teach?

- ❍ Yes (1)
- ❍ No (2)

Answer If Do you use a computer, laptop, smart phone or other handh... Yes Is Selected

Q20 For what purpose/s do you use a computer at the school in which you teach (select all that apply)?

- ❑ Check email (1)
- ❑ Internet resources (2)
- ❑ Social networking (3)
- ❑ Entertainment (4)
- ❑ Work preparation (5)
- ❑ Other (6) _____

Answer If Do you use a computer, laptop, smart phone or other handh... Yes Is Selected

Q25 Approximately how many hours per week do you use a computer at the school in which you teach in total?

- ❍ 0-1 (1)
- ❍ 2-4 (2)
- ❍ 5-10 (3)
- ❍ 10-20 (4)
- ❍ 20-30 (5)
- ❍ 30+ (6)

Answer If Do you use a computer, laptop, smart phone or other handh... No Is Selected

Q26

- ❍ Please Explain (1) _____

Q87 How many years have you been teaching in a Primary School?
- ❍ 0-2 (1)
- ❍ 3-5 (2)
- ❍ 6-10 (3)
- ❍ 11+ (4)

Q88 How many years have you been teaching altogether?
- ❍ 0-2 (1)
- ❍ 3-5 (2)
- ❍ 6-10 (3)
- ❍ 11-20 (4)
- ❍ 21-30 (5)
- ❍ 31+ (6)

Q89 When did you commence work as a Primary School Teacher?
- ❍ Pre 1991 (1)
- ❍ 1991-2000 (2)
- ❍ 2001-2005 (3)
- ❍ 2006-2008 (4)
- ❍ 2009 (5)
- ❍ 2010 (6)
- ❍ 2011 (7)

Q90 Number of years teaching in primary school that had at least one Interactive Whiteboard (IWB)?
- ❍ 0-2 (1)
- ❍ 3-5 (2)
- ❍ 6-10 (3)

Q91 Number of years teaching in primary school classroom that had its own IWB?
- ❍ 0-2 (1)
- ❍ 3-5 (2)
- ❍ 6-10 (3)

Q33 Did you receive training in the use of an IWB during your teacher education at University?

- ❍ Yes (1)
- ❍ No (2)

Answer If Did you receive training in the use of an IWB during your... No Is Selected

Q92 Please select from below to explain why not:

- ❍ IWB training was not available (1)
- ❍ IWB training was available, however I did not have the opportunity to undertake it (please explain why not) (2) _____
- ❍ IWB training was available, however I chose not to do it (please explain why not) (3) _____

Answer If Did you receive training in the use of an IWB during your... Yes Is Selected

Q40 Please indicate how you learned to use an IWB at University during your teacher education:

- ❑ Learned from external experts coming to class/es (1)
- ❑ Learned from recognised experts within the University community (2)
- ❑ Learned by asking peers for help (3)
- ❑ Learned by watching peers (4)
- ❑ Learned by self-exploration (5)
- ❑ Learned by watching University staff use it in their teaching (6)
- ❑ Other (7) _____

Answer If Have you received training in the use of an IWB during yo... Yes Is Selected

Q34 Please indicate if you have been trained in any of the following basic features of IWBs:

- ❑ Learnt to connect computer to IWB & operating projector (1)
- ❑ Familiarisation with key IWB tools (2)
- ❑ Learnt to trouble-shoot common technical difficulties (3)

Answer If Did you receive training in the use of an IWB during your... Yes Is Selected

Q35 Please indicate if you received University training in either of the following :

- ❑ Familiarisation with IWB dedicated software (provide details if possible) (1) _____
- ❑ Familiarisation with IWB subject specific resources (provide details if possible) (2) _____

Answer If Did you receive training in the use of an IWB during your... Yes Is Selected

Q36 Please indicate if at University you learnt how to:

- ❑ Locate suitable internet resources for use on an IWB (1)
- ❑ Import images, sounds and video clips for use on an IWB (2)

Answer If Did you receive training in the use of an IWB during your... Yes Is Selected

Q37 Please indicate if at University you were trained in any of the following pedagogies that support the use of an IWB

- ❑ Learnt how to use an IWB to support mixed learning styles (1)
- ❑ Learnt how to reinforce learning with an IWB (2)
- ❑ Learnt how to enhance student motivation with an IWB (3)
- ❑ Learnt how to incorporate an interactive teaching style (4)

Answer If Did you receive training in the use of an IWB during your... Yes Is Selected

Q38 Please indicate if you received training at University in how to plan lessons using an IWB, as follows:

- ❑ Learnt how an IWB can be used to re-cap previous lessons (1)
- ❑ Learnt how to create lesson sequences and diagrams (2)
- ❑ Learnt the value of a school based resource bank (3)
- ❑ Other (please explain) (4) _____

Q42 Have you used IWBs during your Primary School teaching career?

- Yes (1)
- No (2)

Answer If Have you used IWBs during your Primary School teaching ca... No Is Selected

Q43 Why not? (please select from the following)

- IWBs have not been in the schools where I have taught (1)
- I have seen an IWB being used but have not used one myself (2)
- IWBs have been in the school, however I have not had the opportunity to use one (please explain why not) (3) _____
- IWBs have been in the school, however I have chosen not use one (please explain why not) (4) _____
- Other (5) _____

Answer If Have you used IWBs during your Primary School teaching ca... Yes Is Selected

Q44 Please provide more information (select from the following)

- IWBs are available and I used them often (1)
- IWBs have been available however I rarely used them (please explain why) (2) _____
- IWBs have been available however I used them only occasionally (please explain why) (3) _____
- I have seen an IWB being used but have not used one myself (please explain why) (4) _____

Answer If Have you used IWBs during your Primary School teaching ca... Yes Is Selected

Q45 During your Primary School teaching career, in which subject area/s have you an IWB?

- Please list all areas applicable (1) _____

Answer If Have you used IWBs during your Primary School teaching ca... Yes Is Selected

Q46 How what purpose have you used an IWB? (select all relevant answers)

- ❑ Screen for projection (1)
- ❑ Preloading teaching pages (2)
- ❑ Dragging or hiding items (3)
- ❑ Colour, shading and highlighting items (4)
- ❑ Downloading images or sounds (5)
- ❑ Annotating displayed items (6)
- ❑ Saving work (7)
- ❑ Digitally record interactive learning sequences (8)
- ❑ Displaying student work (9)
- ❑ Revisiting materials (10)
- ❑ Downloading from network (11)
- ❑ Subject specific software (12)
- ❑ Search engine (13)
- ❑ Movement or animation (14)
- ❑ Subject websites (15)
- ❑ National curriculum materials (16)
- ❑ Other (please give details) (17) _____

Q47 Have you had specific training in the use of an IWB during your teaching career?

- ❍ Yes (1)
- ❍ No (2)

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q48 Please indicate if you were trained in any of the following basic features of IWBs:

- ❑ Learnt to connect computer to IWB & operating projector (1)
- ❑ Familiarised with key IWB tools (2)
- ❑ Learnt to trouble-shoot common technical difficulties (3)

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q49 Please indicate if you have received training in either of the following:

- ❑ Familiarised with IWB dedicated software (provide details if possible) (1)
  _____
- ❑ Familiarised with IWB subject specific resources (provide details if possible) (2)
  _____

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q50 Please indicate if you have learnt how to:

- ❑ Locate suitable internet resources for use on an IWB (1)
- ❑ Import images, sounds and video clips for use on an IWB (2)

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q51 Please indicate if you have training in any of the following pedagogies that support the use of an IWB:

- ❑ Learnt how an IWB can support mixed learning styles (1)
- ❑ Learnt how to reinforce learning with an IWB (2)
- ❑ Learnt how to enhance student motivation with an IWB (3)
- ❑ Learnt how to incorporate an interactive teaching style (4)

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q52 Please indicate if you have received training in how to plan lessons using an IWB:

- ❑ Learnt how an IWB can be used to re-cap previous lessons (1)
- ❑ Learnt how to create lesson sequences and diagrams (2)
- ❑ Learnt the value of a school based resource bank (3)
- ❑ Other (please explain) (4) _____

Answer If Did you have specific training in the use of an IWB durin... Yes Is Selected

Q53 What type of professional learning did you receive?

- ❑ Learning from external experts coming to school/s (1)
- ❑ Learning from recognised experts within the school community (2)
- ❑ Learning by asking colleagues for help (3)
- ❑ Learning by watching colleagues (4)
- ❑ Learning by self-exploration (5)
- ❑ Learning from students (6)
- ❑ Other (7) _____

Answer If Have you had specific training in the use of an IWB durin... No Is Selected

Q54 If not, please select one of the following

- ❍ IWB training has not been available (1)
- ❍ IWB training has been available, however I did not have the opportunity to undertake it (please explain why) (2) _____
- ❍ IWB training was available, however I chose not to do it (please explain why you chose not to do it) (3) _____

Q94 Please rank the following from 1-9, indicating your preferred style of learning to use an IWB? (drag and drop into your order) (1 is the most preferred, 9 is the least preferred)

_____ Learning from external experts coming to school/s (1)

_____ Learning from recognised experts within the school community (2)

_____ Learning from asking colleagues for help (3)

_____ Learning from watching colleagues (4)

_____ Learning from self-exploration (5)

_____ Learning from students (6)

_____ Learning through video conferencing (7)

_____ Online learning (8)

_____ Other (9)

Q77 Were IWBs used in any of the schools you attended as a Primary or Secondary School student?

- ❍ Yes (1)
- ❍ No (2)

Answer If Were IWBs used when you were a Primary or Secondary ... No Is Selected

Q78 Why not? (please select from the following)

- ❍ IWBs did not exist in educational facilities at this time (1)
- ❍ IWBs existed, however I did not see a teacher or student using one (2)
- ❍ IWBs existed, however I did not have the opportunity to use one (3)
- ❍ IWBs existed, however I chose not use one when I had the opportunity (please explain why) (4) _____

Answer If Were IWBs used in any of the schools you attended as ... Yes Is Selected

Q79 Please select one of the following

- ❍ IWBs existed and I saw a teacher using one (1)
- ❍ IWBs existed and I saw students using one (2)
- ❍ An IWB was available and I often used one (3)
- ❍ An IWBs was available and I used one occasionally (4)
- ❍ An IWB was available but I rarely used one (please explain why) (5) _____

Answer If Were IWBs used in any of the schools you attended as ... Yes Is Selected

Q80 In which subject area/s was an IWB used?

- ❍ Please list all relevant areas (1) _____

Answer If Were IWBs used in any of the schools you attended as ... Yes Is Selected

Q81 How was the IWB used? (select all relevant options)

- ❑ Screen for projection (1)
- ❑ Preloading teaching pages (2)
- ❑ Dragging or hiding items (3)
- ❑ Colour, shading and highlighting items (4)
- ❑ Downloading images or sounds (5)
- ❑ Annotating displayed items (6)
- ❑ Saving work (7)
- ❑ Digitally record interactive learning sequences (8)
- ❑ Displaying student work (9)
- ❑ Revisiting materials (10)
- ❑ Downloading from network (11)
- ❑ Subject specific software (12)
- ❑ Search engine (13)
- ❑ Movement or animation (14)
- ❑ Subject websites (15)
- ❑ National curriculum materials (16)
- ❑ Other (please explain) (17) _____

Q98 Do you have an IWB in your classroom, or have access to one you can use when you are teaching?

- ❍ Yes (1)
- ❍ No (2)

Q75 Do you believe you are expected to use an IWB in your teaching?

- ❍ Yes (1)
- ❍ No (2)
- ❍ Maybe (please explain) (3) _____

Answer If Are you expected to use an IWB in your teaching? Yes Is Selected Or Are you expected to use an IWB in your teaching? Maybe (please explain) Is Selected

Q76 Do you believe you are capable of using an IWB effectively in your teaching?

- ❍ Yes (1)
- ❍ No (2)
- ❍ Maybe (please explain) (3) _____

Q99 Please describe an example of teaching with an IWB, as follows:

- ❑ Effective use: (1) _____
- ❑ Poor use: (2) _____

Q82 What do you think the benefits are of using an IWB as a teaching tool?
- ❑ Student engagement (1)
- ❑ Student motivation (2)
- ❑ Modern teaching (3)
- ❑ Organisational tool (4)
- ❑ Aligns with your teaching pedagogy (5)
- ❑ Capitalise on Internet resources (6)
- ❑ Utilise software to support teaching (7)
- ❑ Engage students with different learning styles (8)
- ❑ Supports teacher directed learning (9)
- ❑ Facilitates student directed learning (10)
- ❑ Flexibility in group teaching (11)
- ❑ Improves teacher's computer skills (12)
- ❑ Improves students' computer skills (13)
- ❑ Convenience in projecting items (14)
- ❑ None (15)
- ❑ Other (please explain) (16)

Q83 What drawbacks do you think there are in using an IWB as a teaching tool?
- ❑ Consumes extra preparation time (1)
- ❑ Consumes extra time learning new software (2)
- ❑ Waste of time (3)
- ❑ Technology is not reliable (4)
- ❑ Doesn't hold students' attention for long (5)
- ❑ None (6)
- ❑ Other (please explain) (7)

Q84 Do you believe the drawbacks you associate with using an IWB outweigh the benefits of this technology?
- ❍ Yes (1)
- ❍ No (2)

Q96 Have you any suggestions for helping teachers become more effective users of IWBs?
- ❍ Yes (please explain) (1) _____
- ❍ No (2)

Q64 The last part of the survey relates to how you respond to IWBs, as well as your teaching pedagogy, using a 5 point Likert Scale (select from 'Strongly Agree, Agree, Unsure, Disagree, Strongly Disagree' for each statement) The sections are: 1. Perceived usefulness 2. Attitude towards computer use 3. Computer self-efficacy 4. Perceived ease of use 5. Technological complexity 6. Facilitating conditions 7. Teaching pedagogy

Q65 Perceived usefulness of IWBs

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. An IWB is a useful teaching tool (1)	❍	❍	❍	❍	❍
b. IWBs are not suitable for my teaching area (2)	❍	❍	❍	❍	❍
c. It is difficult to think of ways to use an IWB (3)	❍	❍	❍	❍	❍
d. Using an IWB as a teaching tool makes me a better teacher (4)	❍	❍	❍	❍	❍
e. Using an IWB will not improve my teaching (5)	❍	❍	❍	❍	❍
f. Knowing how to use an IWB will not assist my career (6)	❍	❍	❍	❍	❍
g. IWBs are just a passing fad (7)	❍	❍	❍	❍	❍
h. IWBs make it easier to re-cap teaching points (8)	❍	❍	❍	❍	❍

Q66 Attitude towards IWB use

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. There are better teaching tools than IWBs (1)	❍	❍	❍	❍	❍
b. I like using IWBs (2)	❍	❍	❍	❍	❍
c. I do not favour using IWBs in my teaching (3)	❍	❍	❍	❍	❍
d. IWBs are an important teaching tool (4)	❍	❍	❍	❍	❍
e. IWBs are of no interest to me (5)	❍	❍	❍	❍	❍
f. It is important to utilise an IWB in my teaching (6)	❍	❍	❍	❍	❍
g. Good IWB skills are an important component of teaching (7)	❍	❍	❍	❍	❍
h. My teaching will appear more up to date if I use an IWB (8)	❍	❍	❍	❍	❍

Q67 IWB self-efficacy

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. I believe I have the skills needed for using an IWB effectively (1)	❍	❍	❍	❍	❍
b. IWBs frustrate me (2)	❍	❍	❍	❍	❍
c. I could use an IWB if I knew help was available if I had trouble (3)	❍	❍	❍	❍	❍
d. I possess inadequate IWB skills to teach with one (4)	❍	❍	❍	❍	❍
e. Using an IWB makes me nervous and uncomfortable (5)	❍	❍	❍	❍	❍
f. I am confident I can use an IWB (6)	❍	❍	❍	❍	❍
g. I dread using an IWB (7)	❍	❍	❍	❍	❍
h. I could learn to use an IWB if someone showed me how to do it first (8)	❍	❍	❍	❍	❍

Q68 Perceived ease of use of IWBs

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. IWBs are easy to use (1)	❍	❍	❍	❍	❍
b. IWBs make it easier to improvise lessons (2)	❍	❍	❍	❍	❍
c. IWBs are not worth the effort needed to use them (3)	❍	❍	❍	❍	❍
d. I would be more organised if I use an IWB (4)	❍	❍	❍	❍	❍
e. IWBs are difficult to use (5)	❍	❍	❍	❍	❍
f. IWBs are too hard to bother with (6)	❍	❍	❍	❍	❍
g. IWBs are simple and unchallenging (7)	❍	❍	❍	❍	❍
h. Lessons involving IWBs take longer to prepare (8)	❍	❍	❍	❍	❍

Q69 Technological complexity of IWBs

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. I think I am good at using an IWB (1)	❍	❍	❍	❍	❍
b. Trouble-shooting IWB issues is difficult (2)	❍	❍	❍	❍	❍
c. I find problem-solving IWB issues easy (3)	❍	❍	❍	❍	❍
d. IWBs are too complex to use (4)	❍	❍	❍	❍	❍
e. I don't think I am good at using an IWB (5)	❍	❍	❍	❍	❍
f. I struggle to use an IWB well (6)	❍	❍	❍	❍	❍
g. It takes too long to learn how to use an IWB (7)	❍	❍	❍	❍	❍
h. Using an IWB takes too much of my planning time (8)	❍	❍	❍	❍	❍

Q70 Facilitating conditions for using IWBs

	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. Support is readily available for using IWBs (1)	❍	❍	❍	❍	❍
b. The IWB software we have suits my teaching needs (2)	❍	❍	❍	❍	❍
c. IWBs are not reliable and tend to break down (3)	❍	❍	❍	❍	❍
d. There is always an IWB available for me to use (4)	❍	❍	❍	❍	❍
e. I am encouraged to use an IWB (5)	❍	❍	❍	❍	❍
f. There are useful peripheral items I can use in conjunction with an IWB (6)	❍	❍	❍	❍	❍
g. I have seen how other staff members use IWBs (7)	❍	❍	❍	❍	❍
h. I have time to learn how to use an IWB (8)	❍	❍	❍	❍	❍

Q71 Teaching pedagogy	Strongly Agree (1)	Agree (2)	Unsure (3)	Disagree (4)	Strongly Disagree (5)
a. IWBs help my students learn (1)	❍	❍	❍	❍	❍
b. I need to change my teaching pedagogy when using an IWB (2)	❍	❍	❍	❍	❍
c. It is difficult to think of ways to use an IWB (3)	❍	❍	❍	❍	❍
d. My teaching style does not change when I use an IWB (4)	❍	❍	❍	❍	❍
e. IWBs support mixed learning styles, e.g. visual, kinetic (5)	❍	❍	❍	❍	❍
f. Students are more motivated in their learning through an IWB (6)	❍	❍	❍	❍	❍
g. My teaching style does not suit the use of an IWB (7)	❍	❍	❍	❍	❍
h. Students do not like using an IWB (8)	❍	❍	❍	❍	❍

Q86 Is there anything else you would like to add?

- ❍ Yes (1) _____
- ❍ No (2)

Q72 If you are willing to be interviewed about some of the issues raised in the survey in the next stage of this study, please provide your name and email address below. If you choose to participate in the interview and are selected for the study, you will be contacted via the email address you provide.

- ❑ Name (if you are willing to be interviewed) (1) _____
- ❑ Email (2) _____

Q73 Thank you very much for giving your time to this study.

Appendix H

Teo's (2009) Research Instrument

- Constructs and Statements
- Convergent and Discriminant Validities
- Confirmatory Factor Analysis

Research Instrument: Constructs and Statements

Construct (Variable investigated)	Likert Statement
Perceived usefulness	Using Computers will improve my work.
	Using computers will enhance my effectiveness
	Using computers will increase my productivity.
Perceived ease of use (adapted from Davis, 1989)	My interaction with computers is clear and understandable.
	I find it easy to get computers to do what I want it to do.
	I find computers easy to use.
Attitudes toward computer use (adapted from Compeau & Higgins, 1991; Thompson et al. 1991).	Computers make work more interesting.
	Working with computers is fun.
	I look forward to those aspects of my job that require me to use computers.
Technological complexity (adapted from Thompson et al., 1991)	Learning to use the computer takes up too much of my time
	Using the computer involves too much time.
	It takes too long to learn how to use the computer.
Self-efficacy (adapted from Compeau & Higgins, 1995)	I could complete a job or task using the computer if I could call someone for help if I got stuck.
	I could complete a job or task using the computer if someone showed me how to do it first.
Facilitating conditions (adapted from Thompson et al., 1991)	When I need help to use the computer, someone is there to help me.
	When I need help to learn to use the computer, someone is there to teach me.
Behavioural intention	I will use computers in future.
	I plan to use the computer often.

Research Instrument: Convergent and discriminant validities

Results for the measurement model.

Item	SE	*t*-value	R^2	AVE (>0.50)[a]	Cronbach alpha
PU1	0.893	–	0.797	0.72	0.96
PU2	0.922	36.151	0.849		
PU3	0.944	38.646	0.892		
PU4	0.958	40.295	0.918		
PEU1	0.948	52.205	0.899	0.77	0.98
PEU2	0.936	49.092	0.877		
PEU3	0.956	54.727	0.915		
PEU4	0.957	54.968	0.916		
PEU5	0.955	–	0.911		
SN1	0.771	7.552	0.595	0.89	0.91
SN2	1.00	–	1.00		
FC1	0.912	–	0.832	0.79	0.93
FC2	0.929	35.714	0.862		
FC3	0.870	31.330	0.756		
ATU1	0.792	–	0.628	0.55	0.91
ATU2	0.904	25.631	0.818		
ATU3	0.936	26.659	0.875		
BIU1	0.935	–	0.874	0.65	0.96
BIU2	0.960	48.050	0.921		
BIU3	0.938	44.228	0.880		

– This value was fixed at 1.00 for model identification purposes.
AVE: average variance extracted. This is computed by adding the squared factor loadings divided by number of factors of the underlying construct.
SE: standardised estimate.
[a] indicates an acceptable level of reliability or validity.

Research Instrument: Confirmatory Factor Analysis

Model fit indices	Values	Recommended guidelines
χ^2	10.787 $p < .029$	Non-significant
χ^2/df (degrees of freedom)	2.697	<3
SRMR	0.023	<0.05
RMSEA	0.060 (0.017, 0.104)	<0.05 (good fit) <0.08 (fair fit)
CFI	0.989	=>0.90
TLI	0.943	=>0.90

Appendix I

UTAS Faculty of Education Teaching Staff Interview Schedule

The interviews were designed to take about 15-20 minutes and were based on participants' survey responses regarding their experiences with Interactive Whiteboards. The following questions were designed to gain a more detailed understanding of issues in the survey.
In each case answers may be probed by asking why/why not …

Interview Questions

1. How do you feel about the use of IWBs at UTAS for teacher education? (do they matter)

2. Does UTAS actively support your use of IWBs?

3. How effectively do you think you use IWBs?

4. How do you feel about the use of IWBs in schools?

5. How do you think your students feel about using IWBs at UTAS? On professional experience?

6. Are universities doing enough to prepare pre-service teachers for their teaching life with IWBs? Does the training match the need? Is it important?

7. Do you think your teaching would benefit from the development of your IWB skills?

8. Do they suit your teaching style?

    - If yes:

        - How would you describe your teaching style?

        - What type of teaching philosophy underpins your teaching?

    - If no:

        - Why not?

9. Do you think better IWB skills would help your career?
   If yes:
    - In what way?

   If no:
    - Why not?

10. What are the benefits you associate with using an IWB?
11. What are the drawbacks you associate with using an IWB?
12. Can you please describe an experience where you have seen an IWB used well at uni?
    - Why do you think this was so successful?
13. Can you please describe an experience where you have seen an IWB used poorly at uni?
    - Why do you think this was not as effective?
14. Have you ideas on how IWBs may be better integrated at university level? Is this important?
15. How did you incorporate IWBs into your inclusive education lessons?
16. Are there any sort of support structures in place at university to help you with using IWBs? (what sort – perhaps mention pedagogy, basic training, software, troubleshooting, etc)

    If no:
    What sort of support do you think would help you to use an IWB?
17. Have you worked at other universities? If so, how does this compare to the support in place in other universities of schools you have worked in?
18. What type of IWBs are you familiar with?
19. What peripheral items have you used?
20. Are there any you would like to use?
21. Have you had any IWB education since the survey?
    If yes:
    - What did you learn from it?
        - Have you used what you learned?
    - What else do you think you need to learn?

      If no: What sort would you like?

Depending whether or not IWBs were used during own teacher education:

22. What do you remember about IWBs during your teacher education? (i.e. cutting edge technology, discussed but not used, etc)
23. How do you use an IWB as a teaching tool?

If used during own teacher education course:

24. Do you use the IWB in the same/similar way it was used during your teacher education?

25. Has your IWB use evolved in any way? (If so, how?)

If not used during teacher education:

26. Do you think that seeing an IWB used when you were doing your own teacher education course would have been useful?

    If yes:

    - In what way?
    - Any ideas on how they have been used in your course?

    If no:

    - Why not?

Further questions:

27. What recommendations could you suggestion for current teacher education programs regarding the use of IWBs as a teaching tool?

28. How do you feel about using technology in general?

29. What do you think has influenced this attitude?

30. Do you think your attitude towards technology in general influences your attitude towards IWBs?

    If yes:

    - In what way?

    If no:

    - Why not?

31. Is there anything else you would like to say regarding IWBs?

Thank you very much for your time.

Appendix J

Pre-Service Teacher Interview Schedule

The interviews were designed to take about 15-20 minutes and were based on participants' survey responses regarding their experiences with Interactive Whiteboards. The following questions were designed to gain a more detailed understanding of issues in the survey.

In each case answers may be probed by asking why/why not …

Interview Questions

1. How do you feel about the use of IWBs in schools?
2. How do you feel about the use of IWBs at UTAS for teacher education?
3. Do you think your career will benefit from the development of your IWB skills?
4. Do you think an IWB will help your teaching?
   If yes:
   - In what way?

   If no:
   - Why not?
5. Do you think that using IWB will suit your teaching style?
   - If yes:
     - How would you describe your teaching style?
     - What is your teaching philosophy?
   - If no:
     - Why not?
6. What are the major benefits you have seen or have experienced regarding using an IWB as a teaching tool?
7. What problems regarding IWB use have you seen or have experienced?
8. Can you please describe an experience where you have seen an IWB used well?
9. Can you please describe an experience where you have seen an IWB used poorly?
10. Since completing the survey, have you seen any UTAS Faculty of Education teaching staff using an IWB in their teaching?

If yes, then go to 11, if not, go to 14

11. How does the use of IWBs by staff at UTAS compare to how you have seen it during your practicum experience?
12. Was it beneficial for you to see it being used?

If yes:

- In what way?

If no:

- Why not?

If IWBs were not used in teacher education program:

13. Do you think education in using an IWB would have been beneficial to your preparation as a teacher?
    If yes:
    - In what way?
    - Can you suggest ways in which an IWB could have been integrated into your course?

    If no:
    - Why not?
    - Do you think IWBs matter?
14. How well do you feel you are prepared for using an IWB in your future teaching career? (probe for more detail as appropriate – find out how they think they could be best prepared for using them in schools)
15. Which areas do you think you need more IWB training (if any)? (e.g. basic features, resource location, pedagogical training, planning, etc)
16. What type of IWBs/IWB software are you familiar with?
17. What peripheral items have you used? (e.g. tablet/hovercam)
18. How would you go about incorporating IWBs into lessons?
19. You have quite a positive attitude towards using technology - what do you think has influenced this attitude?
20. Do you think your attitude towards technology in general influences your attitude towards IWBs?
    If yes:
    - In what way?

    If no:
    - Why not?
21. Is there anything else you would like to say regarding IWBs?

Thank you very much for your time.

Appendix K

Primary School Teacher Interview Schedule

The interviews were designed to take about 15-20 minutes and were based on participants' survey responses regarding their experiences with Interactive Whiteboards. The following questions were designed to gain a more detailed understanding of issues in the survey.
In each case answers may be probed by asking why/why not …

Interview Questions

1. How do you feel about the use of IWBs in schools?

2. What are the benefits of having an IWB in your classroom?

3. What are the drawbacks you associate with using an IWB?

4. How effectively do you think you use IWBs?

5. Do they suit your teaching style?

    - If yes:

        - How would you describe your teaching style?

6. Does your school actively support your use of IWBs? (PL, trouble-shooting)
    - If yes:
        - What sort of support structures are in place in your school for using IWBs?
    - If no:
        - What sort of support do you think would help you to use an IWB?
7. How have you developed your IWB skills? (e.g. prof learning, self expl, students, colleagues)
    - If you could have more IWB training tomorrow, what would you like to learn?
8. How do you think your students feel about using IWBs?

9. Can you please describe an experience where you have seen or used an IWB used well?

10. Can you please describe an experience where you have seen or used an IWB used poorly?

11. What type of IWBs/IWB software are you familiar with?

12. Have you used any peripheral items in conjunction with your IWB?

13. Do you think your career has benefitted from the development of your IWB skills?

14. How do you feel about the use of IWBs at UTAS for teacher education?
15. Have you had any students on professional experience from uni?
    - If yes, did they have any IWB skills?
16. Did you learn to use an IWB during your own teacher education course? (at uni, or prof exp)
    - *If used during teacher education:*
        - Do you use the IWB in the same/similar way it was used during your teacher education?
        - Has your IWB use evolved in any way?
    - *If not used during teacher education:*
        - Do you think experience with an IWB would have been beneficial to your preparation as a teacher?

            If yes:
            - How do you think IWBs could they have been used in your course?

            If no:
            - Why not?
17. According to your survey, you are usually confident with technology. What has influenced the development of this confident attitude?
18. Do you think your attitude towards technology in general influences your attitude towards IWBs?
19. Is there anything else you would like to say regarding IWBs?

Thank you very much for your time.

Appendix L

Comparison of Responses to Variables by Gender

Variable 1 – Perceptions about the Usefulness of IWBs - Comparison of Responses by Gender

Item No.	Item Statement	Male Mean	Male Std. Dev.	Female Mean	Female Std. Dev.	*t*	*df*	Sig. (2-tailed) *p*
1.	An IWB is a useful teaching tool	1.78	1.003	4.55	0.562	-0.784	143	0.434
2.	IWBs are suitable for my intended teaching area	3.50	1.543	4.15	0.906	-0.248	143	0.804
3.	It is not difficult to think of ways to use an IWB	3.33	1.372	4.02	0.843	-0.229	143	0.819
4.	Using an IWB as a teaching tool will make me a better teacher	3.17	1.425	3.49	1.022	-0.328	143	0.743
5.	Using an IWB will improve my teaching	2.56	1.423	3.72	0.836	-1.644	143	0.102
6.	Knowing how to use an IWB will assist my career	2.94	1.626	3.91	1.121	-0.108	143	0.914
7.	IWBs are not just a passing fad	3.33	1.455	4.22	0.733	-0.289	143	0.773
8.	IWBs make it easier to re-cap teaching points	2.11	1.132	3.96	0.807	-0.765	143	0.446

Variable 2 – Attitude Towards IWBs - Comparison of Responses by Gender

Item No.	Item Statement	Male Mean	Male Std. Dev.	Female Mean	Female Std. Dev.	*t*	*df*	Sig. (2-tailed) *p*
1.	There are not better teaching tools than IWBs	2.30	1.380	2.61	1.282	-0.987	143	0.325
2.	I like using IWBs	1.45	1.050	1.79	1.018	-1.389	143	0.167
3.	I favour using IWBs in my teaching	3.00	1.686	3.23	1.582	-0.604	143	0.547
4.	IWBs are an important teaching tool	1.65	1.040	1.71	0.999	-0.256	143	0.798
5.	IWBs are of interest to me	3.50	1.933	3.63	1.663	-0.322	143	0.748
6.	It is important to utilise an IWB in my teaching	1.80	1.281	1.77	1.009	0.127	143	0.899
7.	Good IWB skills are an important component of teaching	1.85	1.268	1.87	1.136	-0.079	143	0.937
8.	My teaching will appear more up to date if I use an IWB	1.80	1.056	1.82	1.081	-0.062	143	0.951

Variable 3 – IWB Self-Efficacy - Comparison of Responses by Gender

		Male		Female				
Item No.	Item Statement	Mean	Std. Dev.	Mean	Std. Dev.	*t*	*df*	Sig. (2-tailed) *p*
1.	I believe I have the skills needed for using an IWB effectively	2.15	1.387	2.28	1.412	-0.383	143	0.702
2.	IWBs do not frustrate me	3.15	1.843	3.05	1.523	0.270	143	0.788
3.	I could use an IWB if I knew help was available if I had trouble	1.55	1.050	1.77	1.064	-0.853	143	0.395
4.	I possess adequate IWB skills to teach with one	2.55	1.669	2.58	1.531	-0.070	143	0.945
5.	Using an IWB does not make me nervous and uncomfortable	3.15	1.843	3.20	1.586	-0.128	143	0.898
6.	I am confident I can use an IWB	1.65	0.988	2.04	1.201	-1.378	143	0.170
7.	I do not dread using an IWB	3.45	1.932	3.55	1.687	-0.246	143	0.806
8.	I could learn to use an IWB if someone showed me how to do it first	1.65	1.182	1.50	0.989	0.629	143	0.530

Variable 4 – Perceived Ease of Use of IWBs - Comparison of Responses by Gender

		Male		Female				
Item No.	Item Statement	Mean	Std. Dev.	Mean	Std. Dev.	*t*	*df*	Sig. (2-tailed) *p*
1.	IWBs are easy to use	1.75	1.293	2.09	1.136	-1.212	143	0.228
2.	IWBs make it easier to improvise lessons	1.70	1.129	2.07	1.186	-1.311	143	0.192
3.	IWBs are worth the effort needed to use them	3.20	1.963	3.42	1.577	-0.549	143	0.584
4.	I will be more organised if I use an IWB	2.00	1.556	2.40	1.289	-1.251	143	0.213
5.	IWBs are not difficult to use	2.85	1.899	3.13	1.519	-0.733	143	0.465
6.	IWBs are not too hard to bother with	3.20	1.936	3.37	1.584	-0.427	143	0.670
7.	IWBs are simple and unchallenging	2.25	1.650	2.59	1.351	-1.019	143	0.310
8.	Lessons involving IWBs do not take longer to prepare	2.40	1.667	2.82	1.376	-1.218	143	0.225

Variable 5 – Perceived Technological Complexity of IWBs - Comparison of Responses by Gender

		Male		Female				
Item No.	Item Statement	Mean	Std. Dev.	Mean	Std. Dev.	*t*	*df*	Sig. (2-tailed)*p*
1.	I think I am good at using an IWB	1.75	1.209	2.34	1.319	-1.864	143	0.064
2.	Trouble-shooting IWB issues is not difficult	2.20	1.642	2.48	1.235	-0.897	143	0.371
3.	I find problem-solving IWB issues easy	2.15	1.496	2.52	1.255	-1.192	143	0.235
4.	IWBs are not too complex to use	2.95	1.905	3.06	1.510	-0.281	143	0.779
5.	I think I am good at using an IWB	3.00	1.892	2.81	1.485	0.516	143	0.607
6.	I do not struggle to use an IWB well	2.75	1.743	2.73	1.467	0.061	143	0.952
7.	It does not take too long to learn how to use an IWB	2.95	1.877	3.07	1.525	-0.321	143	0.748
8.	Using an IWB does not take too much planning time	2.90	1.861	2.96	1.472	-0.163	143	0.871

Variable 6 – Facilitating Conditions for using IWBs - Comparison of Responses by Gender

Item No.	Item Statement	Male Mean	Male Std. Dev.	Female Mean	Female Std. Dev.	*t*	*df*	Sig. (2-tailed) *p*
1.	Support is readily available for using IWBs	2.25	1.517	2.35	1.252	-0.328	143	0.743
2.	The IWB software suits my intended teaching area	1.75	1.164	2.06	1.141	-1.139	143	0.256
3.	IWBs are reliable and do not tend to break down	2.60	1.729	2.69	1.364	-0.258	143	0.797
4.	There is always an IWB available for me to use	2.60	1.729	2.68	1.429	-0.226	143	0.822
5.	I am encouraged to use an IWB	2.25	1.713	2.33	1.441	-0.219	143	0.827
6.	There are useful peripheral items I can use in conjunction with an IWB	1.80	1.196	2.08	1.126	-1.024	143	0.308
7.	I have seen how staff members use IWBs	3.05	2.038	3.02	1.692	0.062	143	0.951
8.	I have time to learn how to use an IWB	2.05	1.701	2.08	1.330	-0.090	143	0.928

Variable 7 – Pedagogy - Comparison of Responses by Gender

Item No.	Item Statement	Male Mean	Male Std. Dev.	Female Mean	Female Std. Dev.	*t*	*df*	Sig. (2-tailed) *p*
1.	IWBs help students learn	1.40	0.995	1.67	0.990	-1.140	143	0.256
2.	I will not need to change my teaching pedagogy when using an IWB	2.40	1.729	2.84	1.516	-1.182	143	0.239
3.	It is not difficult to think of ways to use an IWB	2.65	1.872	3.21	1.583	-1.427	143	0.156
4.	My teaching style will not need to change when I use an IWB	1.95	1.432	2.22	1.299	-0.839	143	0.403
5.	IWBs support mixed learning styles, e.g. visual, kinetic	1.45	1.099	1.58	0.986	-0.522	143	0.602
6.	Students are more motivated in their learning through an IWB	1.50	1.147	1.79	1.050	-1.141	143	0.256
7.	My teaching style suits the use of an IWB	2.65	1.899	3.21	1.603	-1.408	143	0.161
8.	Students like using an IWB	2.65	1.981	3.44	1.748	-1.842	143	0.067

Appendix M

Comparison of Responses to Variables by Age Group

Variable 1 – Perceptions about the Usefulness of IWBs - Comparison of Responses by Age Group

		18-40		41-61+				
Item No.	Item Statement	Mean	Std. Dev.	Mean	Std. Dev.	*t*	*df*	Sig. (2-tailed) *p*
1.	An IWB is a useful teaching tool	4.49	0.585	4.59	0.548	0.930	120	0.354
2.	IWBs are suitable for my intended teaching area	4.00	0.909	4.24	0.898	1.430	120	0.155
3.	It is not difficult to think of ways to use an IWB	3.83	0.916	4.13	0.777	1.958	120	0.053
4.	Using an IWB as a teaching tool will make me a better teacher	3.51	0.953	3.48	1.070	-0.160	120	0.873
5.	Using an IWB will improve my teaching	3.83	0.732	3.65	0.893	-1.136	120	0.258
6.	Knowing how to use an IWB will assist my career	3.81	1.296	3.97	1.000	0.789	120	0.432
7.	IWBs are not just a passing fad	4.11	0.814	4.29	0.673	1.376	120	0.171
8.	IWBs make it easier to re-cap teaching points	3.83	0.940	4.04	0.706	1.406	120	0.162

Variable 2 – Attitude Towards IWBs - Comparison of Responses by Age Group

Item No.	Item Statement	18-40 Mean	18-40 Std. Dev.	41-61+ Mean	41-61+ Std. Dev.	*t*	*df*	Sig. (2-tailed) *p*
1.	There are not better teaching tools than IWBs	2.79	0.720	3.21	0.664	3.339	120	0.051
2.	I like using IWBs	3.87	0.741	3.96	0.761	0.625	120	0.533
3.	I favour using IWBs in my teaching	3.57	0.878	3.95	0.787	2.431	120	0.057
4.	IWBs are an important teaching tool	3.85	0.722	4.05	0.733	1.492	120	0.138
5.	IWBs are of interest to me	4.19	0.825	4.36	0.584	1.319	120	0.190
6.	It is important to utilise an IWB in my teaching	3.85	0.691	3.92	0.818	0.480	120	0.632
7.	Good IWB skills are an important component of teaching	3.60	0.851	3.89	0.894	1.822	120	0.071
8.	My teaching will appear more up to date if I use an IWB	3.85	0.659	3.84	0.871	-0.075	120	0.941

Variable 3 – IWB Self-Efficacy - Comparison of Responses by Age Group

		18-40		41-61+				
Item No.	Item Statement	Mean	Std. Dev.	Mean	Std. Dev.	*t*	*df*	Sig. (2-tailed)*p*
1.	I believe I have the skills needed for using an IWB effectively	3.28	1.136	3.33	1.070	0.278	120	0.781
2.	IWBs do not frustrate me	3.51	0.906	3.72	0.879	1.266	120	0.208
3.	I could use an IWB if I knew help was available if I had trouble	3.98	0.766	3.91	0.841	-0.476	120	0.635
4.	I possess adequate IWB skills to teach with one	3.06	1.187	2.87	1.143	-0.914	120	0.363
5.	Using an IWB does not make me nervous and uncomfortable	3.66	1.027	3.88	0.805	1.321	120	0.189
6.	I am confident I can use an IWB	3.64	0.895	3.64	0.864	0.010	120	0.992
7.	I do not dread using an IWB	4.09	0.974	4.28	0.708	1.277	120	0.204
8.	I could learn to use an IWB if someone showed me how to do it first	4.06	0.845	4.28	0.831	1.389	120	0.167

Variable 4 – Perceived Ease of Use of IWBs - Comparison of Responses by Age Group

Item No.	Item Statement	18-40 Mean	18-40 Std. Dev.	41-61+ Mean	41-61+ Std. Dev.	*t*	*df*	Sig. (2-tailed) *p*
1.	IWBs are easy to use	3.53	0.776	3.57	0.795	0.243	119	0.809
2.	IWBs make it easier to improvise lessons	3.60	0.825	3.57	0.845	-0.180	119	0.857
3.	IWBs are worth the effort needed to use them	3.87	0.711	4.18	0.605	2.510	119	0.053
4.	I will be more organised if I use an IWB	3.40	0.925	3.05	0.858	-2.123	119	0.056
5.	IWBs are not difficult to use	3.55	0.880	3.80	0.776	1.600	119	0.112
6.	IWBs are not too hard to bother with	3.89	0.759	4.08	0.678	1.416	119	0.159
7.	IWBs are simple and unchallenging	3.15	0.884	2.82	0.866	-1.994	119	0.058
8.	Lessons involving IWBs do not take longer to prepare	3.11	0.729	3.43	0.778	2.302	119	0.053

Variable 5 – Perceived Technological Complexity of IWBs - Comparison of Responses by Age Group

Item No.	Item Statement	18-40 Mean	18-40 Std. Dev.	41-61+ Mean	41-61+ Std. Dev.	*t*	*df*	Sig. (2-tailed) *p*
1.	I think I am good at using an IWB	3.33	0.929	3.20	0.827	-0.797	117	0.427
2.	Trouble-shooting IWB issues is not difficult	2.89	0.832	3.03	0.548	1.192	117	0.277
3.	I find problem-solving IWB issues easy	3.11	0.745	2.92	0.543	-1.622	117	0.107
4.	IWBs are not too complex to use	3.53	0.815	3.81	0.612	2.111	117	0.057
5.	I think I am good at using an IWB	3.51	0.920	3.42	0.828	-0.565	117	0.573
6.	I do not struggle to use an IWB well	3.42	0.866	3.27	0.865	-0.929	117	0.355
7.	It does not take too long to learn how to use an IWB	3.64	0.830	3.77	0.631	0.934	117	0.352
8.	Using an IWB does not take too much planning time	3.44	0.755	3.69	0.661	1.855	117	0.066

Variable 6 – Facilitating Conditions for using IWBs - Comparison of Responses by Age Group

Item No.	Item Statement	18-40 Mean	18-40 Std. Dev.	41-61+ Mean	41-61+ Std. Dev.	*t*	*df*	Sig. (2-tailed) *p*
1.	Support is readily available for using IWBs	3.04	0.767	3.22	0.727	1.224	117	0.223
2.	The IWB software suits my intended teaching area	3.47	0.786	3.58	0.662	0.851	117	0.397
3.	IWBs are reliable and do not tend to break down	3.22	0.704	3.28	0.731	0.452	117	0.652
4.	There is always an IWB available for me to use	2.60	0.837	2.84	0.844	1.495	117	0.138
5.	I am encouraged to use an IWB	3.29	1.014	3.11	1.154	-0.867	117	0.388
6.	There are useful peripheral items I can use in conjunction with an IWB	3.44	0.586	3.55	0.724	0.858	117	0.392
7.	I have seen how staff members use IWBs	2.27	1.176	2.34	1.063	0.340	117	0.734
8.	I have time to learn how to use an IWB	3.36	1.131	3.54	1.049	0.905	117	0.367

Variable 7 – Pedagogy - Comparison of Responses by Age Group

Item No.	Item Statement	18-40 Mean	18-40 Std. Dev.	41-61+ Mean	41-61+ Std. Dev.	*t*	*df*	Sig. (2-tailed) *p*
1.	IWBs help students learn	3.91	0.633	4.04	0.696	1.019	116	0.310
2.	I will not need to change my teaching pedagogy when using an IWB	3.40	0.889	3.42	0.865	0.149	116	0.882
3.	It is not difficult to think of ways to use an IWB	3.69	0.793	3.95	0.621	1.956	116	0.053
4.	My teaching style will not need to change when I use an IWB	3.16	0.852	3.42	0.896	1.614	116	0.109
5.	IWBs support mixed learning styles, e.g. visual, kinetic	3.98	0.723	4.15	0.739	1.245	116	0.216
6.	Students are more motivated in their learning through an IWB	3.877	0.694	3.84	0.746	-0.226	116	0.822
7.	My teaching style suits the use of an IWB	3.78	0.795	3.89	0.737	0.783	116	0.435
8.	Students like using an IWB	3.96	0.928	4.18	0.887	1.300	116	0.196

Appendix N

Comparison of Participants' Hardware/Software Experience

Comparison of Participants' Hardware/Software Experience

	UTAS Staff		Pre-Service Teachers		Primary School Teachers	
Experience with:	Yes	No	Yes	No	Yes	No
IWB	12	6	50	95	2	0
Data Projector	16	2	75	70	1	1
Calculator	17	1	133	12	2	0
CD/Dvd	18	0	135	10	2	0
Video Recorder	17	1	118	27	2	0
Hard Disk Drive	18	0	96	49	2	0
Mobile Phone	15	3	138	7	2	0
iPad	10	8	60	85	0	2
iPod	10	8	90	55	0	2
Personal Computer	18	0	131	14	1	1
Laptop	17	1	135	10	2	0
MacBook or similar	12	6	50	95	0	2
Tablet	5	13	122	23	0	2
Netbook	5	13	44	101	1	1
Printer	18	0	137	8	2	0
Scanner	17	1	132	13	1	1
Webcam	15	3	92	53	0	2
Robot	5	13	7	138	0	2
GPS (Global Positioning System)	10	8	64	81	1	1
Other Hardware	5	13	18	127	0	2
Internet Explorer (or similar)	18	0	136	9	2	0
Word (or similar)	18	0	137	8	2	0
Skype (or similar)	13	5	94	51	0	2
Email	18	0	138	7	2	0
Movie Maker (or similar)	10	8	65	80	0	2
PowerPoint (or similar)	18	0	135	10	2	0
Excel (or similar)	18	0	118	27	1	1
Access (or similar)	10	8	35	110	1	1
Publisher (or similar)	16	2	107	38	2	0
Paint (or similar)	13	5	105	40	2	0
Photo Story 3	3	15	21	124	1	1
Photo Shop (or similar)	12	6	80	65	0	2
Other Software	3	15	7	138	0	2

Appendix O

Background Use of Technology According to Participant Group

Comparison of Background Use of Technology according to Participant Group

	UTAS Staff							Pre-Service Teachers							Primary School Teachers						
Years using a Computer	1-2 Yrs	3-5 Yrs	6-10 Yrs	11-15 Yrs	16-20 Yrs	21-30 Yrs	31+ Yrs	1-2 Yrs	3-5 Yrs	6-10 Yrs	11-15 Yrs	16-20 Yrs	21-30 Yrs	31+ Yrs	1-2 Yrs	3-5 Yrs	6-10 Yrs	11-15 Yrs	16-20 Yrs	21-30 Yrs	31+ Yrs
	7	1	9	1	0	0	0	0	7	25	55	36	20	2	0	0	0	1	0	0	1
Year first accessed a Computer Regularly	Pre 1991	1991-2000	2001-2005	2006-2008	2009	2010	2011	Pre 1991	1991-2000	2001-2005	2006-2008	2009	2010	2011	Pre 1991	1991-2000	2001-2005	2006-2008	2009	2010	2011
	8	6	4	0	0	0	0	24	48	52	16	4	1	0	0	0	1	1	0	0	0
Do you use computer/ tech at home?	Yes				No			Yes				No			Yes				No		
	18				0			145				0			2				0		
Do you access your email at home?	18				0			145				0			2				0		
Do you use the Internet at home?	18				0			145				0			2				0		
Do you use Social Networking at home?	9				9			143				2			0				2		
Do you use the internet for entertainment purposes?	13				5			143				2			0				2		

	UTAS Staff						Pre-Service Teachers						Primary School Teachers					
	Yes				No		Yes				No		Yes				No	
Do you access the internet at home for work purposes?	18				0		145				0		2				0	
	0-1	2-4	5-10	10-20	20-30	30+	0-1	2-4	5-10	10-20	20-30	30+	0-1	2-4	5-10	10-20	20-30	30+
How many hours do you use computers for at home per week?	0	3	4	7	2	2	0	7	15	66	33	24	0	0	2	0	0	0